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MEMORANDUM REPORT

U. S. AIR FORCE
AIR MATERIEL COMMAND
FLIGHT TEST DIVISION
WRIGHT-PATTERSON AIR FORCE BASE
DAYTON, OHIO

SUBJECT: Phase II Tests on the XC-120 Airplane, USAF No. 48-330

SERIAL NO: WCT-2344

CLASSIFICATION: RESTRICTED

DATE: 5 July 1951

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HEADQUARTERS
WRIGHT AIR DEVELOPMENT FORCE

WRIGHT-PATTERSON AIR FORCE BASE, DAYTON, OHIO

MEMORANDUM REPORT ON

WCTSE/NJG/wg
Date 5 July 1951

SUBJECT: Phase II Tests on the XC-120 Airplane, USAF No. 48-330

OFFICE. WCTSE

SERIAL No. WCT-2344

A. PURPOSE:

1. To report the results of Phase II flight tests conducted on the XC-120 airplane, USAF No. 48-330.

B. FACTUAL DATA:

2. Introduction:

Flight tests were conducted in accordance with AMC Hq Office Instruction No. 80-4, dated 23 May 1950. To accomplish these tests 19 test flights, totaling 39.1 hours, were flown at Wright-Patterson Air Force Base by WADC personnel from 18 February 1951 to 6 April 1951. In addition to the above flights, the airplane was flown to Eglin AFB and then to Randolph AFB for display purposes, which required approximately 15 hours of flying time.

3. Description of Aircraft

a. The Fairchild XC-120 airplane is a twin-boom, high wing, all metal cargo type aircraft powered by two Pratt and Whitney R-4360-20W engines, supercharged by single stage, variable speed high blowers. The supercharged engines drive four bladed Hamilton Standard hydromatic full feathering, constant speed, reversible pitch propellers. The propeller blade drawing number is A2H1713-26. The blades were set for a minimum angle of 18°, a maximum angle of 83°, and a negative setting of 21° for reversible pitch operation. The XC-120 is a modification of the C-119B aircraft. Dimensions, design limits, photographs, and general information appear in Appendix II of this report. The cargo section (pack) can be detached from the aircraft (carrier) which is designed to have satisfactory flying characteristics with or without the pack. The quadricycle landing gear consists of four retractable dual-wheel units, two in each nacelle.

b. All equipment, with the exception of the hydraulic brake system and the hydromatic propellers, is electrically operated. The elevator and rudders are equipped with spring-loaded tabs in addition to

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the trim tabs. Both ailerons are equipped with mechanical balance tabs. The aileron and rudder trim tabs are electrically operated, while the elevator trim tab is manually operated. The airplane is equipped with electrically controlled automatic cowl flaps, oil cooler flaps, and carburetor air heat, but manual selection is also provided. During the Phase II tests, the automatic feature for the cowl flaps and carburetor air heat were deleted.

4. Test Configuration:

The airplane was weighed with a full fuel load of 2798 gallons and full oil tanks (120 gallons), and the pack attached to the carrier and then reweighed with the pack detached. The airplane was flown at a take-off gross weight of 64,000 pounds with pack on and 55,000 pounds with pack off at various CG's. With pack on and full fuel, oil, test equipment of approximately 2500 pounds, and a crew of five, the airplane weighed approximately 63,000 pounds. An additional 1000 pounds of ballast was needed to load the airplane to its design weight of 64,000 pounds. However, this was not a sufficient amount of ballast to obtain and maintain a forward CG of 20% M.A.C.; therefore, it was necessary to reduce the fuel load so additional ballast could be placed in the nose to obtain the forward CG and still not exceed the design weight limits.

5. Cockpit Layout:

In general, the cockpit was comfortable and well arranged for pilot conveniences. Entering and leaving the cockpit with pack on was accomplished through the pack and up a ladder to the crew compartment. With pack off, entrance was gained by means of a collapsible, portable ladder to the crew compartment. The ladder may be extended and retracted from crew compartment hatch to the ground, or from the ground to the carrier.

b. The control column strikes the pilot's and copilot's seat when the seats are in the full forward position. Movement of the seat one inch to the rear would relieve this condition. The control wheel was mounted too low and interferred with the average pilot's knees.

c. All cockpit controls were placed in such a manner as to be readily available to the pilot; however, on the overhead panel in the emergency section, the fire warning lights, engine fire extinguisher, fuel shut off, and heater fire extinguisher switches are not sufficiently well segregated as to make the group or individual switches readily distinguishable in an emergency. Also, on the overhead panel are three important switches (hydraulic brake pump, main inverter, auto pilot inverter) in the same proximity that can easily be knocked to the "off" position when the copilot (with back pack parachute) leaves his seat. One or more of these switches were knocked to the "off" position several times during the test program in the above manner.

d. The master battery and engine switch handles are designed in such a manner that they give a false indication as to the position of the switch. The impression is given that the index of the handle is 180° opposite to its actual position. When grasping the handle, the index end is completely covered, concealing the switch position. Local remedy was made by painting an arrow on the switch handle proper, indicating the index end. The detent for the master battery switch is such that the switch isn't always placed in the "on" position for starting the engines in that the detent is not positive enough to insure correct seating.

e. With shoulder harness in the locked position, it is impossible for the copilot to reach the landing gear control switch without unlocking the harness release or maintaining a loose shoulder harness. Both pilot's and copilot's shoulder harness inertia release malfunctioned at critical times. Local reworking of the unlocking mechanism enabled a normal release to be made on subsequent flights.

f. Both pilot's and copilot's brake pedals are installed on the same plane as the rudder stirrups. It is impossible to tell if the foot is centered on the brake pedal or partially on the brake and stirrup, with the rudder stirrup and brake pedal installed on the same plane. If the pilot's foot is offset on the brake pedal it is possible to apply force to the rudder stirrup but with no resulting brake action.

6. Taxiing and Ground Handling:

a. The quadricycle type gear, with the long stroke auxiliary gear oleo struts and suspension, lends itself to a smooth, soft ride during taxiing. Although braking action causes the aircraft to bob, this is not considered objectionable as its magnitude is limited and dampens out readily. Direction is readily controlled, during all ground maneuvers, by application of brakes, rudders, or engines or combinations of all three. Although the aircraft turning radius is somewhat larger than most aircraft of this size, the turning radius is not excessive and allows ready movement on the ramp. In general, the ground handling characteristics were considered superior or equal to most nonsteerable tricycle geared aircraft; however, the design of the auxiliary nose gear does not permit the aircraft to be backed up by use of reverse thrust. This hinders the utility of the aircraft somewhat in ground maneuvering.

b. The method of ground towing is somewhat more complicated and restricted than conventional or tricycle-geared aircraft. Conventional ground handling equipment must be supplemented with special equipment, as shown on Page 15, Appendix II, to keep both wheels tracking parallel to each other when backing up and also to maintain directional control. This necessitates carrying the extra equipment in the aircraft, if landings are to be made at bases other than the home base.

c. Visibility from the cockpit is good during ground movement.

7. Take-Off and Initial Climb:

a. During performance take-offs at 64,000 pounds pack on and full power applied before brake release, the aircraft had a definite tendency to turn to the left shortly after brake release, although full right rudder was applied. This necessitated asymmetric power to insure adequate directional control. At about 35 knots (40 mph) full power could be applied to both engines with no loss of directional control. Directional control was adequate throughout the take-off run in the pack off configuration.

b. During short field take-offs, care must be exercised to avoid contacting the pack skid (with pack on or rudders with pack off) with the runway. It was possible to do this in either configuration even at forward CG's; thus, maximum C_L take-offs were avoided.

c. Visibility forward, in all configurations, was excellent at all times during normal take-offs and initial climb.

d. The extended landing gear imposed a high degree of drag; therefore, it was advisable to accomplish the retraction as soon as practicable after take-off. Several times during the test program the gears failed to retract simultaneously. When this occurred, there was a slight yaw in the direction of the extended gear. The pilot was always cognizant if one gear failed to retract because of the resulting yaw and drag.

e. When the landing gear starts to retract there is a slight deceleration as the auxiliary landing gear fairing passes through the vertical plane where it offers a flap plate area 90 degrees to the slip stream. Early tests were flown with a time delay lag that momentarily halted the auxiliary gear in the vertical plane during the retraction cycle. This created a very undesirable drag; however, this condition was later eliminated by timing the auxiliary gear retraction so that immediate retraction started when the landing gear was placed in the "up" position.

f. All take-offs were made with wide-open cowl flaps and oil shutters set to 30° open. Take-offs were conducted with the wing flaps in the take-off position (15°) and in the "up" position. It was impossible to obtain military power in a static position because of the propeller low pitch setting of 18°; however, military power was developed shortly after brake release and maintained throughout the take-off and climb out. To reduce variables to a minimum, maximum power was applied before brake release and the gear was left down until above the 50-foot obstacle. The take-offs were recorded photographically and the data plotted in Appendix III. The data, corrected to standard conditions and 3000 bhp, are tabulated in the following table:

Take-Offs
BHP-3000 at T.O.
T.O. Flaps Unless Noted

* Indicates Flaps Up

T.O. No.	Conf. Pack	Gross Wt #	Ground Roll-Ft	Total Dist. to 50' Obst. Ft.	True Air Speed at 50' Knots	True Air Speed at T.O. Knots	Indicated Air Speed at 50' Knots	Indicated Air Speed at T.O. Knots
*1	on*	64,000	2180	3390	96	88	-	88
2	off	55,000	1260	1997	90	75	85	73
3	off	55,000	1245	2189	91	73	78	71
4	off	55,000	1585	2226	90	78	83	78
*5	off*	55,000	1540	2420	97	82	96	91
6	on	64,000	1655	2558	100	83	85	83
7	on	64,000	1775	3140	105	86	82	77

8. Climb Performance:

a. Sawtooth climbs were flown with pack on and off in order to check the manufacturer's estimated best rate of climb. The data compare favorably with the contractor's estimated data. The sawtooth climbs were flown with wide open cowl flaps, fixed oil cooler shutters, and normal rated power. The data have been corrected to standard conditions and are plotted in Figures 2 and 3, Appendix I.

b. Two check climbs, pack on and off, were made to service ceiling using wide open cowl flaps, fixed oil shutters, and normal rated power. Climb speed was determined from the sawtooth climbs and from the contractor's estimated data. All climb data have been corrected to standard atmospheric conditions and are plotted in Figure 1, Appendix I. The climb performance at 2550 rpm is summarized in the following table:

ALTITUDE FT.	BHP/ENG	R/C FT/MIN. PACK ON	PACK OFF	T/C MIN. PACK ON	PACK OFF
S. L.	2560	700	1060	0	0
6,000	2630	780	1140	8.0	5.5
10,000	2470	640	1030	13.5	9.5
15,000	2340	480	900	22.0	14.5
20,000	2120	260	660	36	20.5
22,800	1960	100 S.C.	490	51.0	25.5
28,000	1610	---	100 S.C.	---	45.5

c. Single engine climbs, clean configuration, pack on and off, were conducted with the left propeller feathered and all cooling devices closed. The right engine was operated at military power with the cowl flaps wide open and the oil cooler shutters fixed at 35° open. The contractor's best single engine climb speeds were used for the single engine climbs. The absolute (zero rate of climb) single engine ceiling, for pack on and at a gross weight of 63,000 pounds, was 3300 ft. The estimated maximum rate of climb is 50 ft. per minute at 2,000 ft. The service ceiling for "pack off" and at a gross weight of 54,500 pounds, was 6800 feet. All data have been corrected to standard conditions and are plotted in Figure 1, Appendix I.

9. Level Flight Performance:

a. Speed versus power data were obtained at 10,000 and 18,000 feet, pack on and off. The speed power at 10,000 feet, pack on, was flown at a constant cowl flap setting of 2.0 inches open and oil shutters set to 30 degrees open. The speed power at 10,000 feet, with pack off, was flown at a constant cowl flap setting of 2.5 inches open and oil shutters set to 30 degrees open. The data obtained from the speed versus power tests at 10,000 feet, corrected to standard atmospheric conditions and to a gross weight of 62,700 pounds, pack on, and 54,000 pounds, pack off, are plotted in Figures 4 and 5, Appendix I. The data obtained from the speed versus power tests at 18,000 feet, corrected to standard atmospheric conditions, are presented in the following table:

CONFIGURATION	WEIGHT LBS	MAXIMUM BHP	V_T KNOTS	COWL FLAPS INCHES OPEN	OIL SHUTTERS DEG. OPEN
Pack On	62,000	2260	218	2.2	30
Pack Off	53,700	2260	232	1.0	30

Fuel flows were obtained at 10,000 feet only and are presented in the form of brake specific fuel consumption and nautical air miles per pound curves as shown in Figures 6 and 7, Appendix I.

b. The combat range of the XC-120 airplanes, as calculated below, exceeds the manufacturer's estimated range. The following method was used to determine the combat range:

(1)	Take-off gross weight	64,000 pounds
(2)	Total fuel at standard weight of 6 lbs/gal	16,788 pounds
(3)	5% fuel reserve	840 pounds
(4)	Fuel for ground operations	600 pounds
	Remaining usable fuel	15,348 pounds
(5)	Climb to 10,000 ft at NRP	800 pounds
	Remaining usable fuel	14,548 pounds
	Time to climb to 10,000 ft - 14 minutes at ave. V_t of 120 knots. Distance flown 30 nautical miles.	
(6)	Cruise at 10,000 ft until remaining fuel, 14,548 pounds has been consumed. Cowl flaps 2.0 inches open, ave. conditions for item No. 6. V_t 157 knots, NAMPP 0.1346, weight 55,300 lbs.	
	Distance flown	1950 nautical miles
	Total distance flown	1980 nautical miles

NOTE: This does not allow for the possibility of trapped fuel or for let down and landing.

10. Air-speed Calibration:

The XC-120 airplane was paced, both with pack on and off, by a Flight Test Division F-51 pacer. The standard air-speed system was approximately 35 mph in error; however, the Fairchild Aircraft Company has plans for installing a new air-speed system. For this reason only the swivel system was calibrated. The curve is shown in Figure 12, Appendix I.

11. Cooling:

Cooling data were taken throughout the climb to service ceiling and during various speed power runs with pack off. Ground cooling was conducted when the air was calm. Only 11 cylinder heads were instrumented by Fairchild Aircraft Corporation for this test and the data are shown in Figures 9, 10, and 11, Appendix I. Cylinder head B-1 was connected to the temperature indicator on the pilot's instrument panel;however, during flight, cylinder B-2 was found to have the hottest head.

12. Stalling characteristics:

a. Straight ahead and accelerated stalls, pack on and off, were made in the cruise, glide, power approach, and landing configuration. Power-on stalls were undesirable in that lateral control, without exception, was lost before longitudinal control was depleted. Power off stalls were satisfactory, with the exception that very little stall warning was noticed.

b. Power-on stalls were more pronounced in that the loss of lateral control occurred before full up elevator or stall was obtained. The degree of lateral control loss and the rapidity with which the loss occurred seemed to be proportional to the amount of power on the engines at the time of lateral control loss. With loss of aileron effectiveness, the aircraft would roll predominately to the left. The roll was not abrupt or violent and could be controlled by dropping the nose until air speed sufficient for aileron effectiveness was obtained.

c. In conjunction with the power-on stalls, there was a pronounced heavy nibbling and snatch of the ailerons preceding loss of aileron control. This increased in amplitude also in proportion to the increase in power. With rated or military power, if the wheel was allowed to jerk into a full up or down aileron position, an aileron lock would result. The aileron lock was pronounced and necessitated the pilot using both hands on the wheel to recover. This condition was not experienced during the power-off stalls and seemed to be precipitated entirely by change in air flow over the wing resulting from various power settings. Use of flaps or cowl flaps have little or not contribution to the aileron lock. During a NRP stall, clean configuration, the angle of attack was very high and aileron snatch occurred at an IAS of 64 knots (74 mph) followed by aileron lock at 62 knots (72 mph). Insufficient rudder to keep the ball centered was encountered in all power-on stalls (NRP) just before the stall.

d. Power-off stalls have little prestall warning. Two miles above actual stall, aileron nibble and slight buffet occurs. Addition of flaps down aggravates the buffet, giving slightly more stall warning. At the best, stall warning appears only about 4 mph above stall. Recovery from power-off stall may be made by lowering the nose slightly to gain air speed.

13. Control Friction:

Static control friction tests were conducted on the elevator, rudder, and aileron systems, during no-wind conditions, and found to be considerably higher than the allowable limit of 8 pounds for elevator, 15 pounds for rudder, and 6 pounds for ailerons, as per USAF Specification 1815-B. Plots showing control deflection versus force are shown in Figures 13 to 15, Appendix I.

14. Dynamic Stability:

a. Longitudinal

The dynamic longitudinal stability characteristics were good. Tests were flown at a mid CG. Positive (2.0) and negative (0.0) g's were applied to the aircraft in the cruise configuration by rapid deflection of the elevator. Release of the controls on both tests resulted in a damping of oscillation within limits.

b. Lateral

This test, stick free, was conducted by yawing the aircraft 5° to the left or right in a wings level position. When the controls were suddenly released the rudder controls would return to neutral but the aileron controls remained in a fixed position because of the high friction force and resulted in the airplane rolling. The above test was repeated, except that the ailerons and rudders were returned manually to neutral after the 5° yaw to check control fixed characteristics. Results were somewhat more desirable indicating satisfactory stability in the control fixed configuration. Plots of stick fixed configurations are presented in Figures 50 and 51, Appendix I.

15. Longitudinal Stability:

a. Static

(1) The longitudinal stability is very similar to the C-119B airplane in that it is very difficult to obtain reliable data because of the high static friction forces and lag of the spring tab. Tests were flown in the cruise, power approach, and landing configuration, pack on and off. The control forces for cruise and power approach configurations are, with minor exceptions, within the static friction band. Cruise and power approach configurations, stick fixed, pack on and off, do not meet Specification 1815-B, in that the most forward stick-fixed neutral point shall be at least 5% of the mean aerodynamic chord aft of the most rearward center-of-gravity position. The stick-fixed neutral points for cruise configuration, pack on and off, are approximately 30% M.A.C. The stick-fixed neutral points for power approach configuration, pack on, varied between 20.8 to 28.6% M.A.C., and pack off, 24.6 to 27.6% M.A.C. throughout the allowable speed range.

(2) The landing configuration, pack off, conforms with Specification 1815-B, in that the stick-fixed neutral points are aft of 35% M.A.C. Qualitative data only were obtained with pack on in the landing configuration. The impression was given that in this configuration the airplane behaved essentially the same as with pack off. Plots showing the static longitudinal characteristics are presented in Figures 16 through 35, Appendix I.

b. Maneuvering Characteristics:

Stick force per "g" in the cruise configuration, pack on and off, are within limits as specified by 1815-B; however, the control forces for power approach and landing configurations exceed the limits specified by 1815-B, but are not considered objectionably high. There was no tendency toward a control force reversal in any configuration tested. Maneuvering characteristic tests were conducted in the cruise configuration, pack on, and in the cruise, power approach, and landing configuration, pack off, at both forward and aft CG positions. The results of these tests are plotted in Figures 36 through 43, Appendix I.

16. Longitudinal Trim Changes:

Longitudinal trim changes were conducted on the XC-120, both with pack off and pack on, at a mid CG loading of approximately 25% M.A.C. There were no excessive forces encountered and sufficient elevator trim was available to return the elevator forces to zero for the various tests listed below:

Longitudinal Trim Changes
Pack Off
CG 25% ±1.5%

	Trim Speed I/c Knots	Trim Condition Flaps	Gear	Power	Elev. Trim Tab Angle Deg.	Variable Action	Increment Required to Maintain Trim Speed After Completing Variable Action: Elev. Pos. Deg.	Elev Stick Force Lb
1.	112.5	Up	Up	*	.6 ND	Gear Dn	2 Up	9 Pull
2.	112.5	Up	Dn	*	.5 NU	Flaps Dn	3 Dn	14 Push
3.	112.5	Dn	Off	Off	.7 NU	T.O. Power	5.2 Dn	14 Push
4.	111.5	Dn	Dn	T.O.	1.5 ND	Gear Up	3 Dn	7 Push
5.	111.5	Dn	Up	T.O.	2.0 ND	Flaps Up	3.6 Up	4 Pull
6.	185	Up	Up	NRP	.8 ND	Power Off	.9 Up	14 Pull

Pack On
CG 25% ±1.5%

	Trim Speed I/c Knots	Flaps	Gear	Power	Elev. Trim Tab Angle Deg.	Variable Action	Elev. Pos. Deg.	Elev Stick Force Lb
1.	112	Up	Up	*	0	Gear Dn	2.6 Up	10 Pull
2.	113	Up	Dn	*	1.5 NU	Flaps Dn	3.8 Dn	10 Push
3.	112	Dn	Dn	*	.1 ND	Power Off	4.8 Up	28 Pull
4.	112	Dn	Dn	Power Off	1.8 NU	T.O. Power	7.8 Dn	24 Push
5.	112	Dn	Dn	T.O. Power	1.5 ND	Gear Up	3.5 Dn	9 Push
6.	112	Dn	Up	T.O. Power	3.4 ND	Flaps Up	7.75 UP	22 Pull
7.	100	T.O.	Dn	T.O. Power	.4 ND	Gear Up	2.7 Dn	11 Push
8.	112	T.O.	Up	T.O. Power	1.6 ND	Flaps Up	2.4 Up	9 Pull
9.	181	Up	Up	NRP	1.2 ND	Power Off	1.4 Up	18 Pull

* RPM 1800 Torque 130 psi

17. Elevator Power During Take-Off:

a. Elevator power is more than adequate for take-offs in the "pack on" and "off" configuration. In the "pack on" configuration, the nose wheel was lifted off at an IAS of approximately 52 knots (60 mph) at a forward CG of 20.7% MAC, and with "pack off" at a CG of 23.6% MAC, the nose wheel lift-off speed occurred below the operating range of the air-speed indicator of 43 knots (50 mph). Elevator effectiveness was sufficient to raise the nose to such an extent as to drag the pack skid or rudders with "pack on" or "off;" therefore, judicious use of elevators is recommended on performance take-offs.

18. Directional Stability:

a. Directional control characteristics were marginal. An asymmetric power condition, clean configuration, was investigated with No. 1 propeller feathered and cowl flaps closed and military power (60.5", 2700 rpm) on the No. 2 engine. It was impossible to center the ball, using full rudder trim or rudder deflection, belown an IAS of 113 knots (130 mph).

b. In the power approach configuration, (flaps and gear down) and with both engines producing normal rated power, there was insufficient rudder to maintain directional control during a stall. There was a gradual flat turn to the left with full right rudder. This condition was of insufficient magnitude to be objectionable and was not considered critical as it only occurred above the stall speed and at high power settings.

c. When power was used as a variable different directional characteristics were obtained with gear up than with gear down. In the gear up configuration little variation in directional trim change was noted with the variation of power setting; however, in the gear down configuration, in flight, there is a noticeable directional trim change with power variation. The trim change was sufficient to merit retrimming to maintain coordinated flight, although the rudder force was of very small magnitude.

d. In maneuvering flight, for all configurations, it was necessary to use rudders for coordinated turns.

e. Steady sideslips were accomplished in the Power, Cruise, and Power Approach configuration, "pack on" and "off." Sideslip characteristics are considered normal throughout the range tested; however, sideslip angles were restricted because of the limited rudder travel, which was approximately 10 degrees less than the total rudder deflection for the C-119B type airplane. Plots of sideslips are presented in Figures 44 to 49, Appendix I.

19. Approach and Landing:

a. Longitudinal control during approach and landing was good. Little elevator trim was necessary in the approach, flare, or landing to achieve the proper landing attitude. Elevator forces were not excessive and could be easily controlled by the pilot. All landings were accomplished with power off, full flaps, and at a gross weight of approximately 64,000 pounds, "pack on", and 54,000 pounds, "pack off." Cowl flaps were closed and oil shutters set to 30 degrees. Reverse pitch propellers were used for each landing; however, maximum short field landings were not attempted because of the possibility of striking the skid or tail during touch down. Maximum braking power was not used because of the danger of blowing tires. All landings were photographed and the data plotted in Pages 27 through 31, Appendix III. The data, corrected to standard conditions, are tabulated in the following table:

Land No.	Pack	Gross Weight Pounds	Ground Roll Ft	Total Dist from 50' Obstacle Ft	TAS at 50' Knots	TAS at T.D. Knots	IAS at 50' Knots	Air Speed at T.D. Knots
1.	Off	54,500	1423	2392	97	83	105	81
2.	Off	54,300	1058	1771	97	78	104	87
3.	Off	54,100	1192	1941	90	88	96	87
4.	On	63,600	1233	1969	94	90	98	90
5.	On	63,500	1176	1813	96	84	98	89

20. Pack Handling Characteristics:

a. In general, the ground handling of the pack was very good; however, it is believed that a self-centering device should be added to the pack for ease of operation in joining the pack to the carrier. While the airplane was at Wright-Patterson AFB for Phase II tests, four spring-loaded switches, located at each suspension point and used for slack hoist cable operations, were replaced with three way switches (up, down, off) thus enabling one man to accomplish the entire operation of lowering or raising the pack. An unusual amount of time is consumed in lowering or raising slack hoist cables for attachment to the pack or to store in the carrier. Two-speed hoist mechanisms should be incorporated to correct this condition. The hoist motors were tested by raising the pack with approximately 12,000 pounds of ballast distributed in the pack and with no outside power source. No difficulties were experienced during this operation.

21. General:

a. Crew comfort was satisfactory with the exception of a high noise level during take-off at higher power setting. A high frequency vibration of the compartment floor aft of the pilots' seats, was very objectionable to the crew at various power settings. A slight aerodynamic roughness, in the form of a mild shaking of the aircraft frame, was felt in flight. This roughness was experienced with and without the pack and with all cowl flap settings. It is believed to be the result of turbulent air flow from the carrier striking the horizontal stabilizer.

b. The following items were a source of trouble:

(1) Failure of the internal control locks.

(2) Erratic indication of the fuselage door warning light.

(3) The inverter switches, etc. so placed that they were inadvertently knocked to the off position when the copilot left his seat.

(4) The wheel-well doors hanging approximately 1-1/4 inches open in flight during the entire test program.

(5) The left brake would grab, during taxiing operation, when normal pressure was applied to the brake pedal.

(6) The electrical system was overloaded when feathering a propeller and retracting the landing gear simultaneously.

C. CONCLUSIONS:

22. It is concluded that:

a. The control friction, for all controls, is objectionably high.

b. The single engine rate of climb, pack on clean configuration and at 64,000 pounds, is less than 100 ft per minute at 2000 ft.

c. Longitudinal stability does not meet Specification 1815-B.

d. There is insufficient lateral control at low speeds.

e. There is insufficient directional control at low speeds.

f. The control wheel interferes with the pilot's knees.

g. The brake pedal angle in relation to the rudder stirrup is undesirable.

h. The shoulder harness release in unsatisfactory.

i. The landing gear switch is located too far from the copilot.

j. The design of the control locking system is very poor.

k. The index end of the master battery and engine switch should be so marked.

l. Care must be exercised to insure that the master battery switch is actually "on" when the switch is turned to the "on" position.

m. The force necessary to operate the propeller circuit breakers is too light.

n. Heavy buffeting of the elevator occurs when reversing the propellers during a landing.

o. The oil cooler and cowl flap switches are confusing by not operating in like direction for normal operation.

p. With the pack detached the towing equipment is too large to carry in the carrier.

q. In attaching, or disengaging, the pack to or from the carrier, approximately half of the time required for the complete operation is consumed in lowering or stowing the hoist cables after the pack has been dropped or attached.

r. It would be difficult to attach the pack to the carrier during blackout or gusty conditions without a centering device.

s. Estimated performance and test results are presented in the following table:

CONDITION	ESTIMATED PERFORMANCE		TEST PERFORMANCE	
	PACK ON	PACK OFF	PACK ON	PACK OFF
Gross weight at T.O. pounds	64,000	55,000	64,000	55,000
Maximum speed at 18,000 ft. knots	211	229	218	232
Time to climb to 10,000 ft (min)	10.4	7.0	13.5	9.5
Service ceiling - 2 engine ft	23,625	27,300	22,800	28,000
Service ceiling - 1 engine Military power - ft	4,210	13,500	None	6,800
Take-off distance over 50 ft.	2,800	2,060	2,560	2,000
Combat range at 10,000 ft. naut. mi.	1,865		1.980	

D. RECOMMENDATIONS:

23. It is recommended that:

a. The control friction for all controls be reduced to meet USAF Specification 1815-B.

b. Single engine performance, "pack on," be improved to the point that the aircraft would be militarily usable.

c. Longitudinal stability be improved to meet military requirements.

d. Lateral control be improved at low speeds to meet military requirements.

e. Directional control be improved at low speeds to meet military requirements.

f. The control wheel be raised so it does not interfere with the pilot's knees.

g. The brake pedals be installed on a plane or angle different from the rudder stirrup angle.

h. The shoulder harness release be modified, so the release will work each time the release lever is actuated.

i. The gear switch be relocated so as to be easily accessible to the copilot and pilot.

j. The internal control lock be redesigned.

k. Guards be installed for the hydraulic brake pump, main and automatic inverter switches.

l. The index end of the master battery and engine switches be so marked.

m. The master battery switch be replaced with a positive position switch.

n. The force necessary to operate the propeller circuit breakers be increased.

o. Elevator buffeting be decreased or eliminated during propeller reversal operation.

p. The oil cooler switches be located near the cowl flap switches and operate in the same direction as the cowl flap switches.

q. The towing equipment be modified so it may be conveniently stowed in the carrier when the pack is detached.

r. A two-speed hoist mechanism be installed for ground pack operations.

s. A self centering device be added to the pack for ease of operation in joining the pack to the carrier.

Memorandum Report No. WCT-2344

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APPENDIX I

1. Data Analysis

a. Introduction:

This section briefly discusses the methods of reduction used in analyzing the test data. The following reports will be referred to in this discussion:

No. 1 "Performance Flight Testing Methods in Use by the Flight Section", USAF Technical Report No. 5069

No. 2 "Pressure Altitude Method of Flight Test Data Reduction", AMC Memorandum Report No. TSFTE-2060

No. 3 "Model R-4360-20, -20W, Engine Specification", No. N-7056-C, dtd 23 September 1949

No. 4 "A Simplified Manifold Pressure Correction", AMC Memorandum Report No. TSCEP5E-1919

No. 5 "Army-Navy Aeronautical Specification Test Procedure for Aircraft Power Plant Installations", AN-T-62, dtd 31 October 1944

b. Take-off and Landing:

Distance, time, and height data for the take-off and landing tests were obtained with the photographic equipment at Wright Field. All data were then plotted on the curves shown in Appendix III. Other data tabulated on these curves were obtained from the airplane except the wind velocity and direction which were recorded by the photoscope crew. The distances and air speeds at take-off and at an altitude of 50 feet were taken from these curves and corrected to an NACA Standard, sea-level, no-wind day by the following equations:

(1) For Take-offs

$$\text{Corrected Ground Roll} = \text{Test Ground Roll} \ \left((V + V_W)/V\right)^{1.85} \times \sigma \times R$$

V = Ground Speed at T.O. - ft/sec

V_W = Component of wind down runway - ft/sec headwind (+)

σ = Density ratio

$$R = \frac{\text{Rate of climb at equivalent altitude}}{\text{Rate of climb at sea level}}$$

Equivalent Altitude = Pressure altitude - .36 x (pressure altitude - density altitude)

Corrected air distance (point of take-off to an altitude of 50 feet) = (test air distance + V_W t) x $\sigma^{1/2}$ x R

Where t = time from lift off to an altitude of 50 ft

Weight corrections were made by the expression:

$$S_W = S_c \, (W_s/W_t)^n$$

Where S_W = distance corrected for weight

S_c = distance corrected for wind, altitude, and power

W = gross weight, test and standard

n = 2.7 for ground roll
2.2 for total distance

(2) For landings the corrected ground roll = test ground roll $(V + V_W)/V^{1.85} \times \sigma$ and corrected air distance = test air distance + $(V_W t)$. No weight corrections have been developed for landing distances.

c. Climb

(1) Climb data were reduced to the rate of climb that would have been obtained in standard air with standard horsepower at the climb speeds tested. The equation used for this reduction was:

$$R/C_{std} = \frac{dh}{dt} \times \sqrt{\frac{T_T}{T_S}} + \frac{33{,}000\, n}{W} \left(bhp_S - bhp_t \sqrt{T_S/T_T}\right)$$

Where $\frac{dh}{dt}$ = test rate of climb

T_T = test free air temperature, Kelvin

T_S = standard free air temperature, Kelvin

n = propeller efficiency usually taken as .8

W = test gross weight

bhp_S = standard brake horsepower

bhp_t = test brake horsepower

Development of this method is outlined in Reference No. 2. Climb data were also corrected to a weight corresponding to a standard take-off gross weight minus the weight of the fuel used to warm-up, taxi, take-off, and climb to the test altitude. Thus, climbs were corrected to a different weight at each altitude. This correction was made by use of the equations:

$\Delta R/C_1 = R/C_T \times \Delta W/W_s$ = rate of climb change for ΔW at the same hp

and $\Delta R/C_2 = \dfrac{21{,}900 \; W}{V_c \, \sigma^{1/2} \, e \, b^2}$ = rate of climb change for induced drag change because of ΔW

Where R/C_T = Test rate of climb

$\Delta W = W_s - W_t$

W_s = Standard gross weight

V_c = Calibrated air speed - mph

σ = Density ratio

e = Airplane efficiency factor

b = Airplane wing span - ft

These equations were developed and presented on nomograms in Reference No. 1.

(2) Standard horsepower for climb was taken as the horsepower developed in standard air with standard carburetor air temperature at the test air speed with either 50 inches of mercury manifold pressure or full throttle and full high blower. This was accomplished by the following procedure:

(a) Obtained standard carburetor air temperature, CAT_S.

$$CAT_S = CAT_t + T_s - T_t$$

(b) Corrected the brake horsepower to CAT_s at test manifold pressure.

$$BHP = BHP_t \sqrt{CAT_T/CAT_S}$$

(c) Obtained the MAP change owing to the CAT change at a constant blower speed from curves appearing in Reference No. 1 [illegible] simplified the equation

$$MAP_s = P_i \left[\frac{T_{K_T} \quad (MAP_T/P_i)^{.238} - 1}{T_{K_S}} + 1\right]^{3.53}$$

Where P_i = Inlet pressure, "Hg

MAP_S = Standard day manifold absolute pressure, "Hg

MAP_t = Test manifold absolute pressure, "Hg

T_{K_T} = Test inlet air temperature, ° Kelvin

T_{K_S} = Standard inlet air temperature, ° Kelvin

(d) Corrected the BHP for this change in MAP from figure 1 developed from engine manufacturer's power curves, Reference No. 3, assuming a constant blower speed. The test point was at this point corrected to standard conditions but if below the full throttle high blower point, may not have been on the desired 50 "Hg of manifold pressure.

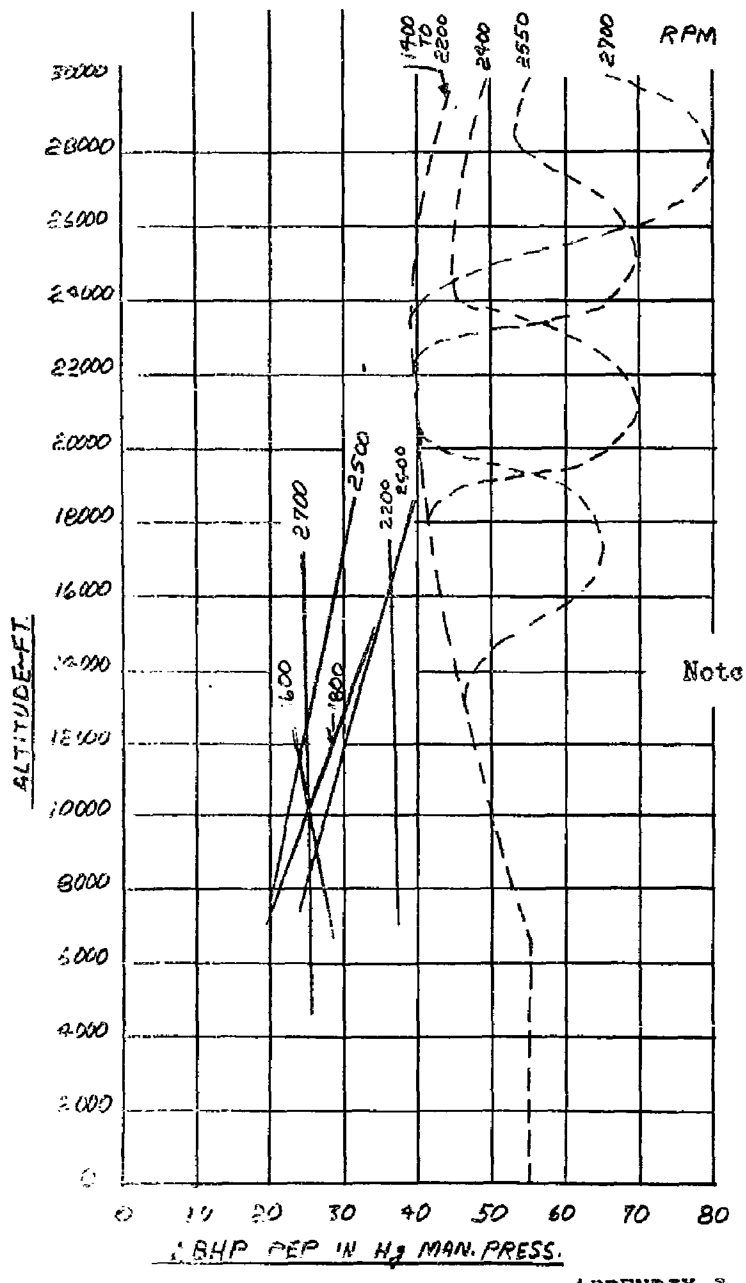
(e) Placed the MAP on the schedule and corrected the horsepower for this change in MAP from figure 1 assuming a change in blower speed if in the slip region of the clutch and constant blower speed if not. These two corrections are shown on the following page in graph form.

Fig. No. 1
Power Correction
Chart
R-4360-20W Engine

Legend

——— BHP/in Hg gained by varying M.P. through changing blower speed.

- - - - BHP/in Hg gained or lost by changing M.P. without changing blower speed(rpm, cat & throttle constant)



Note: Curves were constructed from Pratt & Whitney Spec. No. N-7056, curve No. T-1013, Sheets 3 & 5

APPENDIX 1

d. Level Flight

(1) Speed versus horsepower calibrations were obtained at various altitudes by stabilizing the air speed in level flight with various power settings. The test data were corrected to standard day atmospheric conditions by adjusting the horsepower to that necessary to maintain the test air speed with the formula:

$$HP_{std} = HP_t \sqrt{T_s/T_t}$$

Where HP_s = horsepower required to fly the test air speed on a standard day

HP_t = horsepower delivered on the test day

T = free air temperature, Kelvin
sub s = standard and sub t = test

An induced drag correction for weight was applied by the formula:

$$\Delta BHP = \frac{.3318\ (W_s^2 - W_t^2)}{n\ e\ b^2 \sigma\ V}$$

Where n = .83 = propeller efficiency

e = .77 = airplane efficiency

b = wing span, ft

σ = density ratio

V = true air speed, mph

This formula is solved graphically in Reference No. 1

(2) All speed versus power data were also reduced to a Piw versus Viw curve by the equations:

$$Viw = V_e/(W_s/W_t)^{1/2}$$

$$Piw = P\ \sigma\ 1/2(W_s/W_t)^{3/2}$$

$$Niw = N\ \sigma\ 1/2(W_s/\ W_t)^{1/2}$$

Where Viw = weight reduced indicated air speed

V_e = equivalent air speed = $V_c - \Delta V_c$

Piw = weight reduced indicated horsepower

P = test horsepower

Niw = weight reduced indicated rpm

N = test rpm

W = gross weight, sub s = standard and sub t = test

σ = density ratio

e. Cooling

Engine cooling data were recorded during some of the level flight tests and during one of the climbs to service ceiling. A Brown automatic temperature recorder was employed for obtaining the temperatures. Cooling corrections were made as follows:

(1) Air Force Hot Day

$$T_c = T_t + \left[(T_{std} - T_T) + 23^\circ \right] K$$

Where T_c = corrected to Air Force hot day [illegible]

T_t = test temperature

T_{std} = standard temperature at altitude

k = correction factor defined in Specification AN-T-62

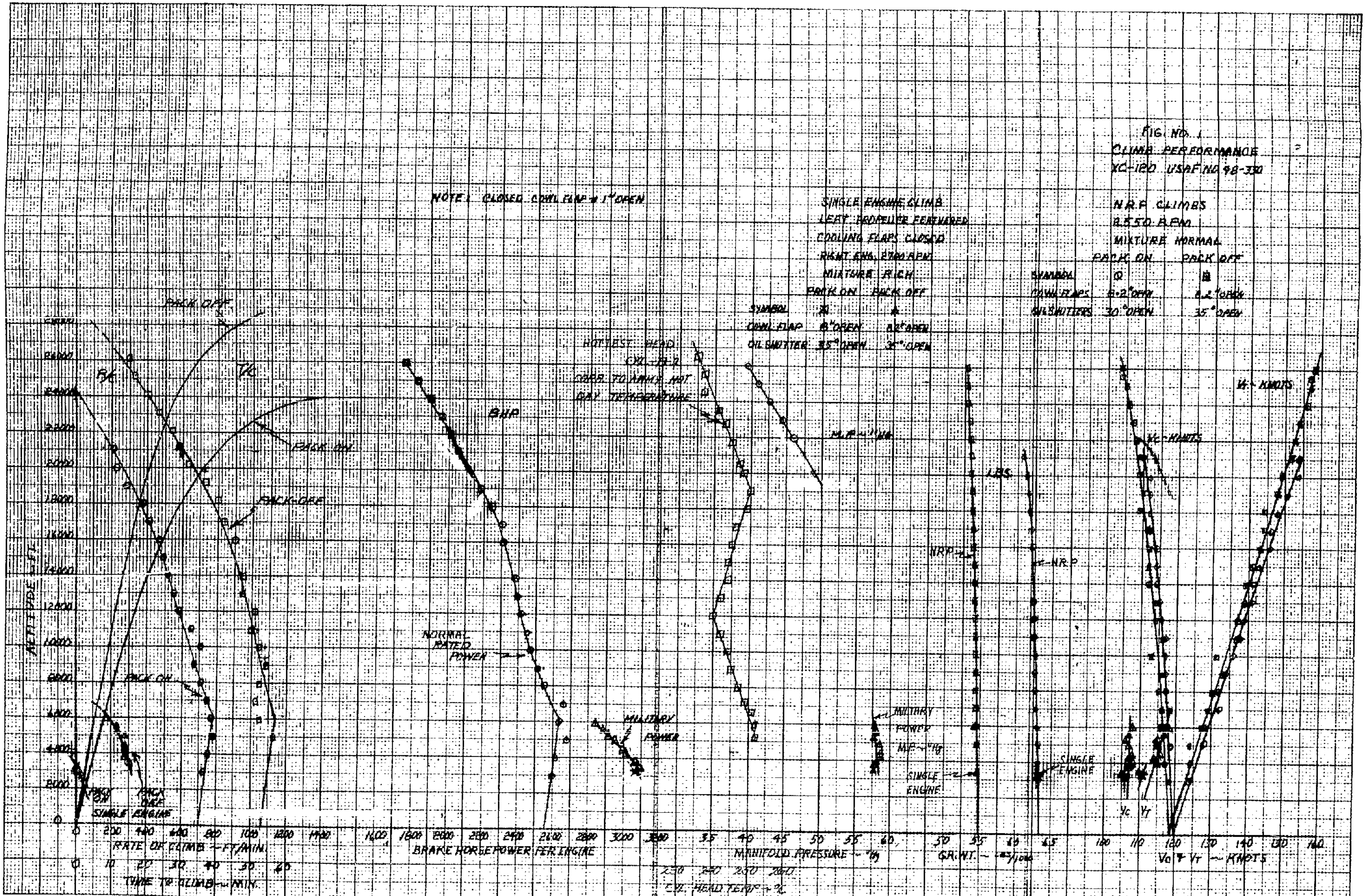


FIG. NO. 1
CLIMB PERFORMANCE
XC-120 USAF NO 48-330
N.R.P. CLIMBS
2550 R.P.M.
MIXTURE NORMAL
PACK ON PACK OFF
SYMBOL
COWL FLAPS 6.2" OPEN 8.2" OPEN
OIL SHUTTERS 30° OPEN 35° OPEN
NOTE: CLOSED COWL FLAP = 1" OPEN
SINGLE ENGINE CLIMB
LEFT PROPELLER FEATHERED
COOLING FLAPS CLOSED
RIGHT ENG. 2700 RPM
MIXTURE RICH
PACK ON PACK OFF
SYMBOL
COWL FLAP 8" OPEN 8.2" OPEN
OIL SHUTTER 35° OPEN 35° OPEN
HOTTEST HEAD
CORR. TO ARMY HOT DAY TEMPERATURE
PACK OFF
PACK ON
R/C
T/C
PACK ON PACK OFF SINGLE ENGINE
BHP
NORMAL RATED POWER
MILITARY POWER
M.P. ~ "Hg
MILITARY POWER
MP ~ "Hg
SINGLE ENGINE
LBS.
NRP
SINGLE ENGINE
Vc - KNOTS
Vt - KNOTS
Vc
Vt
ALTITUDE ~ FT.
RATE OF CLIMB ~ FT/MIN.
TIME TO CLIMB ~ MIN.
BRAKE HORSEPOWER PER ENGINE
MANIFOLD PRESSURE ~ "Hg
CYL. HEAD TEMP ~ °C
GR. WT. ~ #/1000
Vc & Vt ~ KNOTS

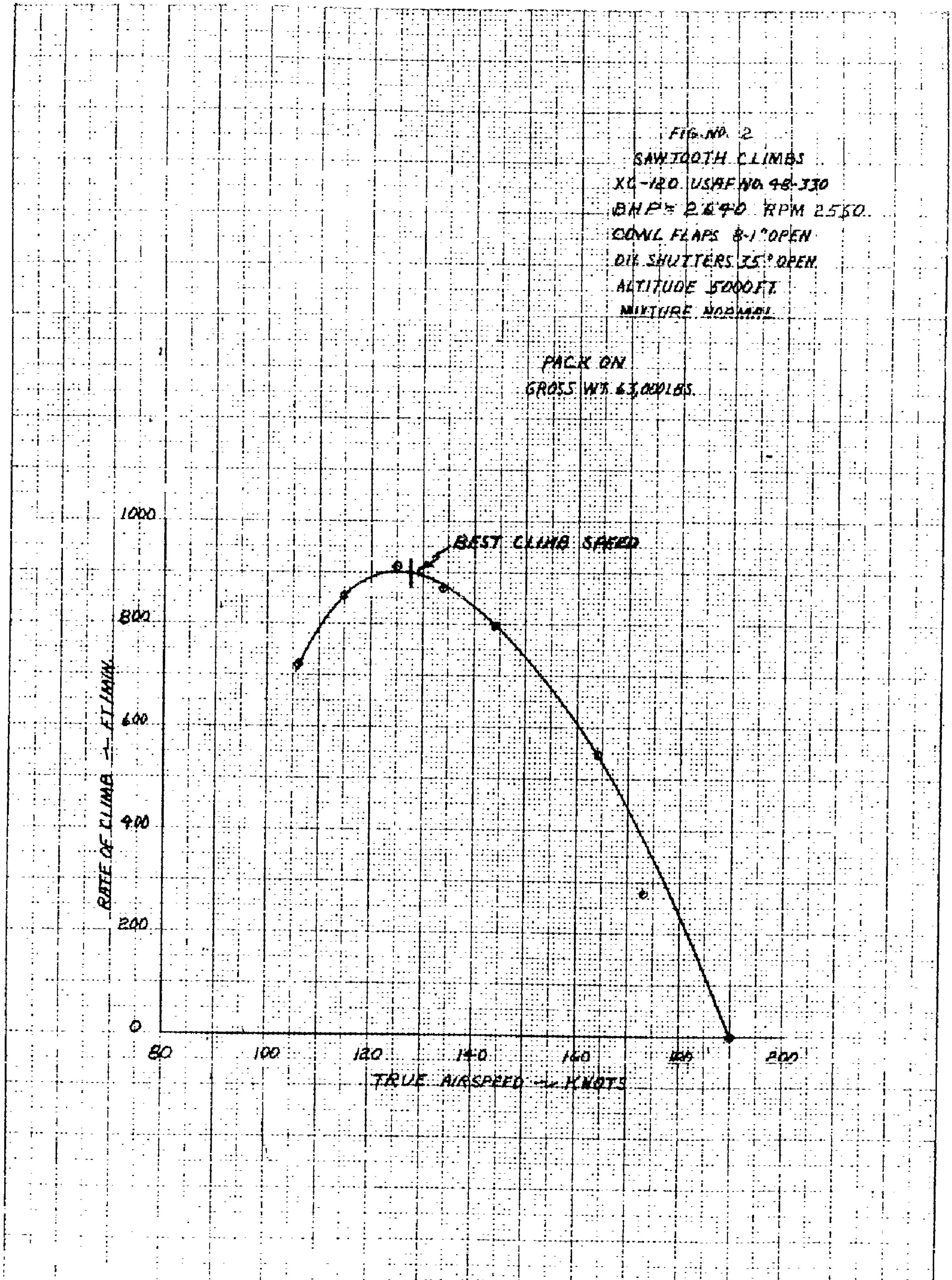


FIG. NO. 2
SAWTOOTH CLIMBS
XC-120 USAF NO. 48-330
BHP = 2640 RPM 2550.
COWL FLAPS 8-1° OPEN
OIL SHUTTERS 35° OPEN.
ALTITUDE 5000 FT.
MIXTURE NORMAL
PACK ON
GROSS WT. 63,000 LBS.
BEST CLIMB SPEED
RATE OF CLIMB ~ FT/MIN.
TRUE AIRSPEED ~ KNOTS
1000
800
600
400
200
0
80
100
120
140
160
180
200

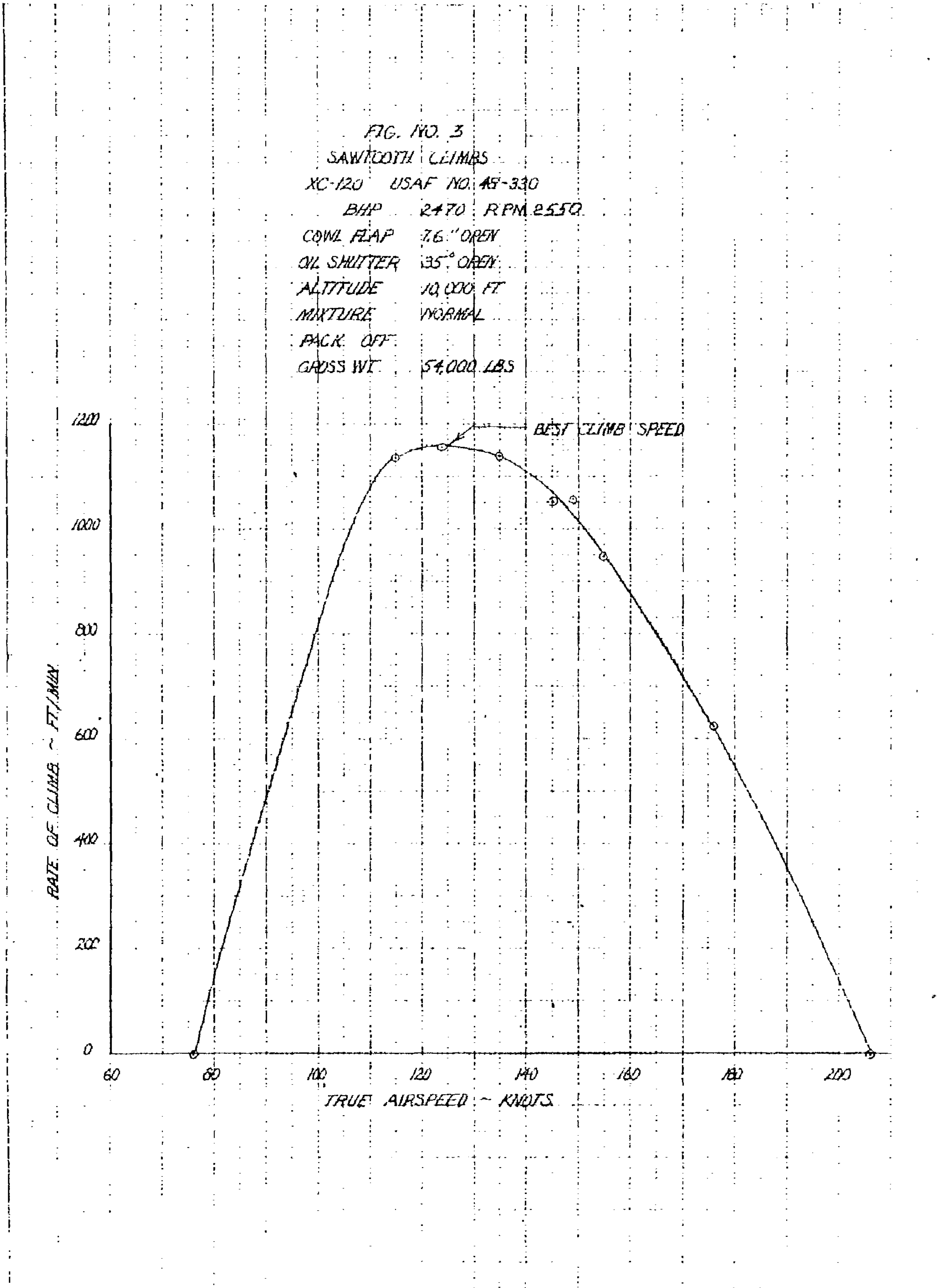


FIG. NO. 3
SAWTOOTH CLIMBS
XC-120 USAF NO. 45-330
BHP 2470 RPM 2550
COWL FLAP 7.6" OPEN
OIL SHUTTER 35° OPEN
ALTITUDE 10,000 FT
MIXTURE NORMAL
PACK OFF
GROSS WT 54,000 LBS
BEST CLIMB SPEED
RATE OF CLIMB ~ FT/MIN
1200
1000
800
600
400
200
0
60
80
100
120
140
160
180
200
TRUE AIRSPEED ~ KNOTS

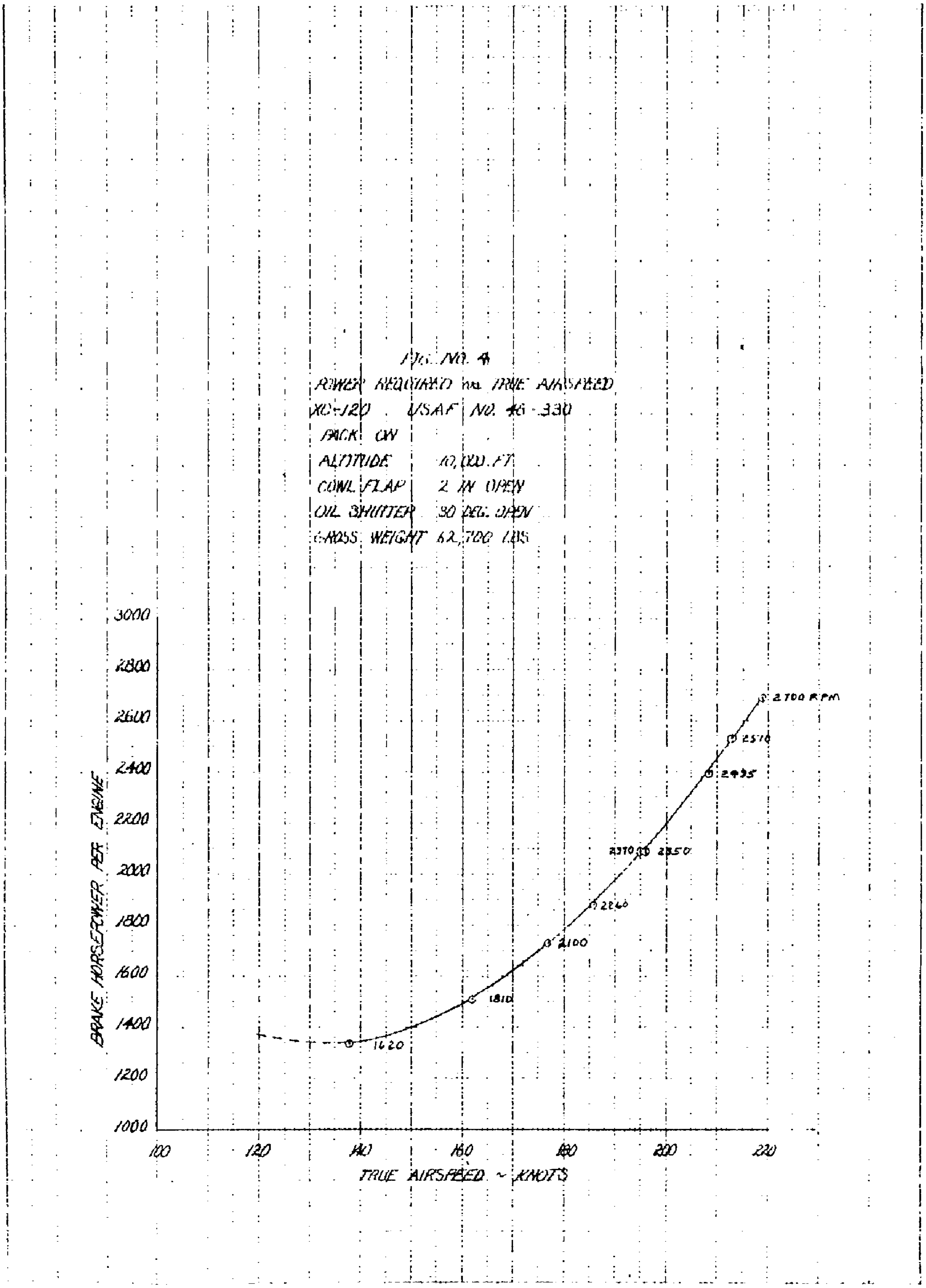


FIG. NO. 4
POWER REQUIRED vs. TRUE AIRSPEED
XC-120 USAF NO. 46-330
PACK ON
ALTITUDE 10,000 FT
COWL FLAP 2 IN OPEN
OIL SHUTTER 30 DEG. OPEN
GROSS WEIGHT 62,700 LBS
BRAKE HORSEPOWER PER ENGINE
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
100
120
140
160
180
200
220
TRUE AIRSPEED ~ KNOTS
2700 RPM
2570
2495
2370
2350
2260
2100
1810
1620

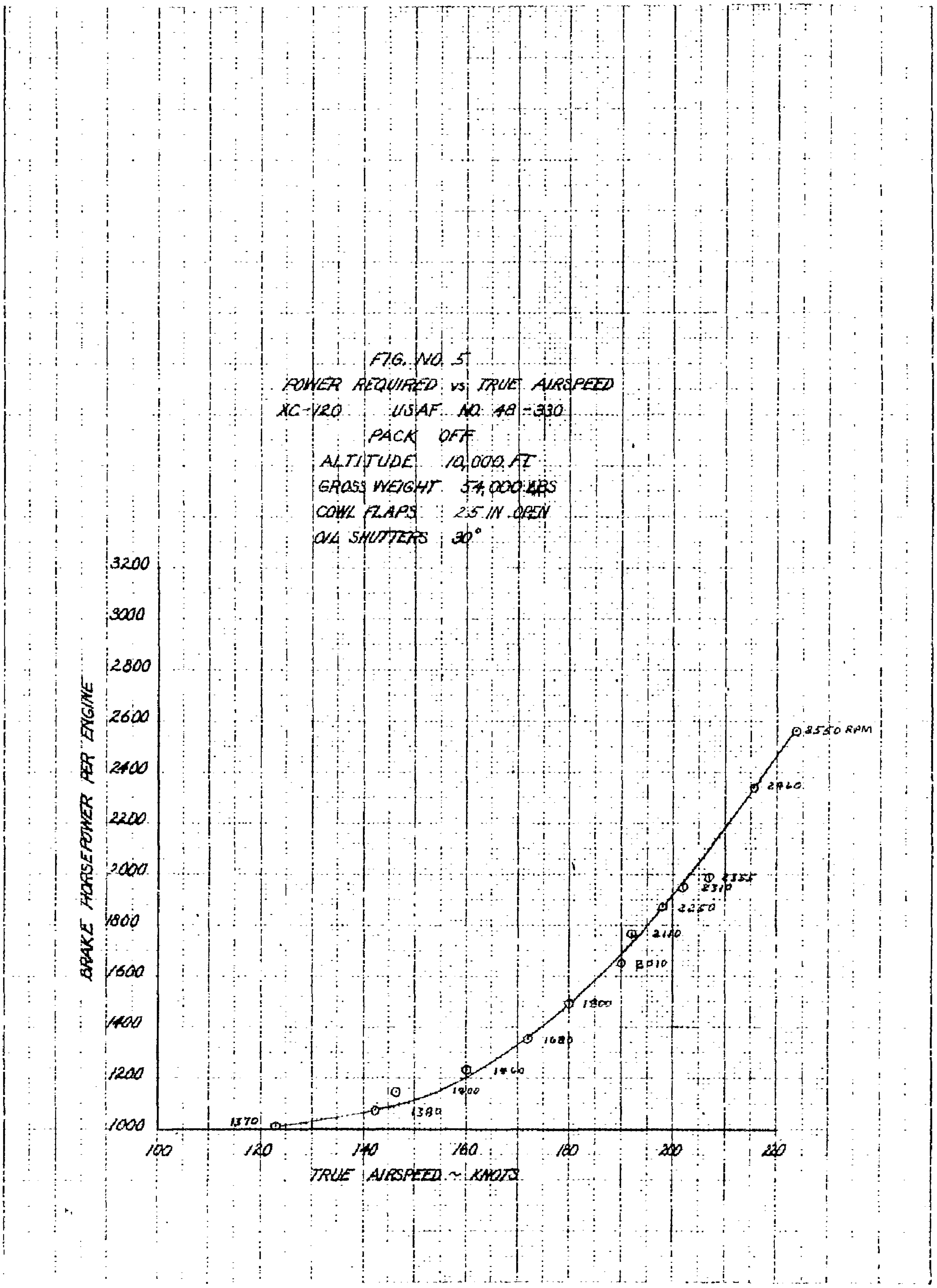
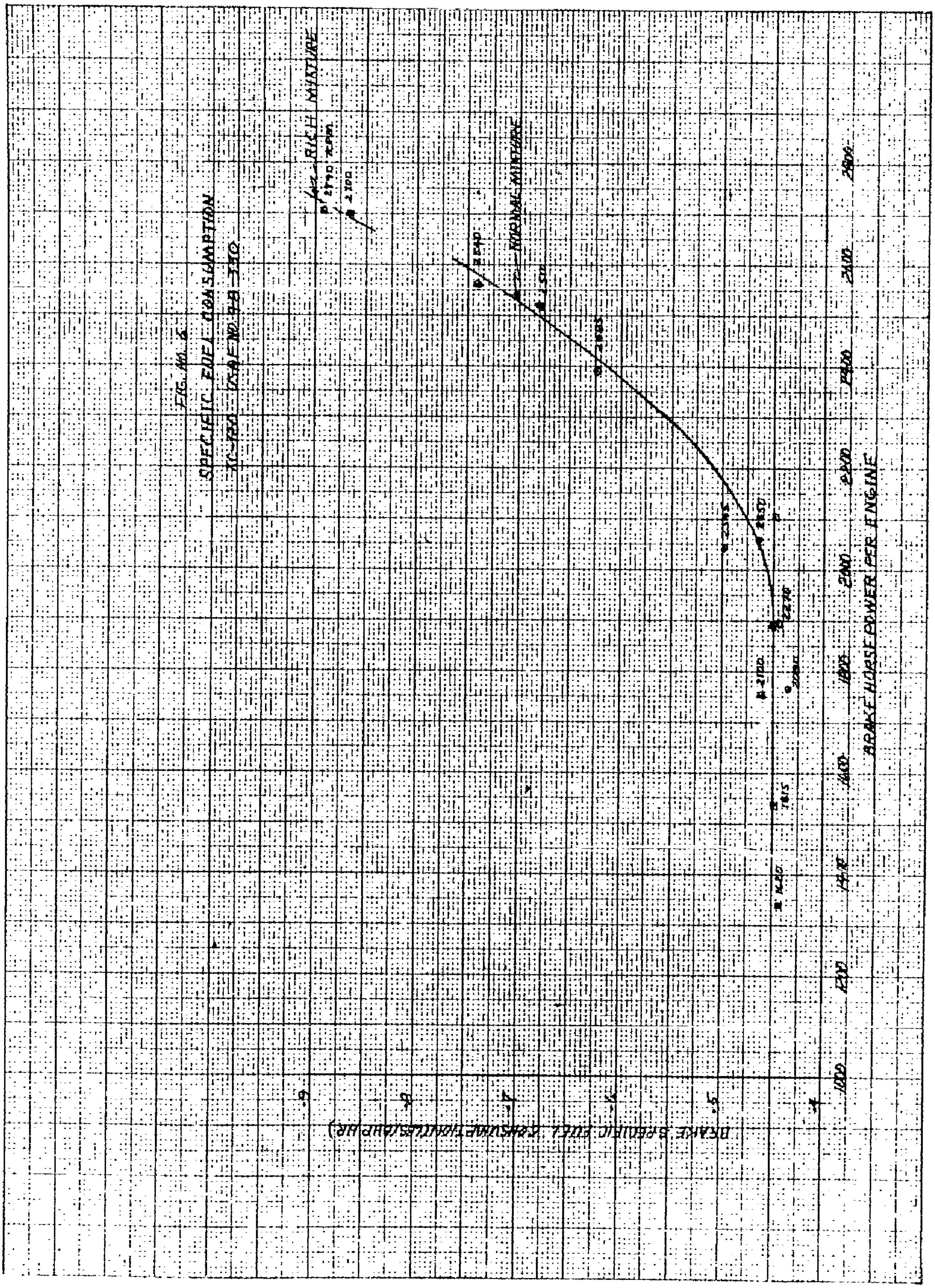


FIG. NO. 5
POWER REQUIRED vs TRUE AIRSPEED
XC-120 USAF NO. 48-330
PACK OFF
ALTITUDE 10,000 FT
GROSS WEIGHT 54,000 LBS
COWL FLAPS 2.5 IN. OPEN
OIL SHUTTERS 30°
BRAKE HORSEPOWER PER ENGINE
TRUE AIRSPEED ~ KNOTS
2550 RPM
2460
1370
1380
1400
1400
1680
1800
2010
2110
2250
2310
100
120
140
160
180
200
220
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200


SPECIFIC FUEL CONSUMPTION
RICH MIXTURE
NORMAL MIXTURE
BRAKE HORSEPOWER PER ENGINE
.9
.8
.7
.6
.5
.4
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800

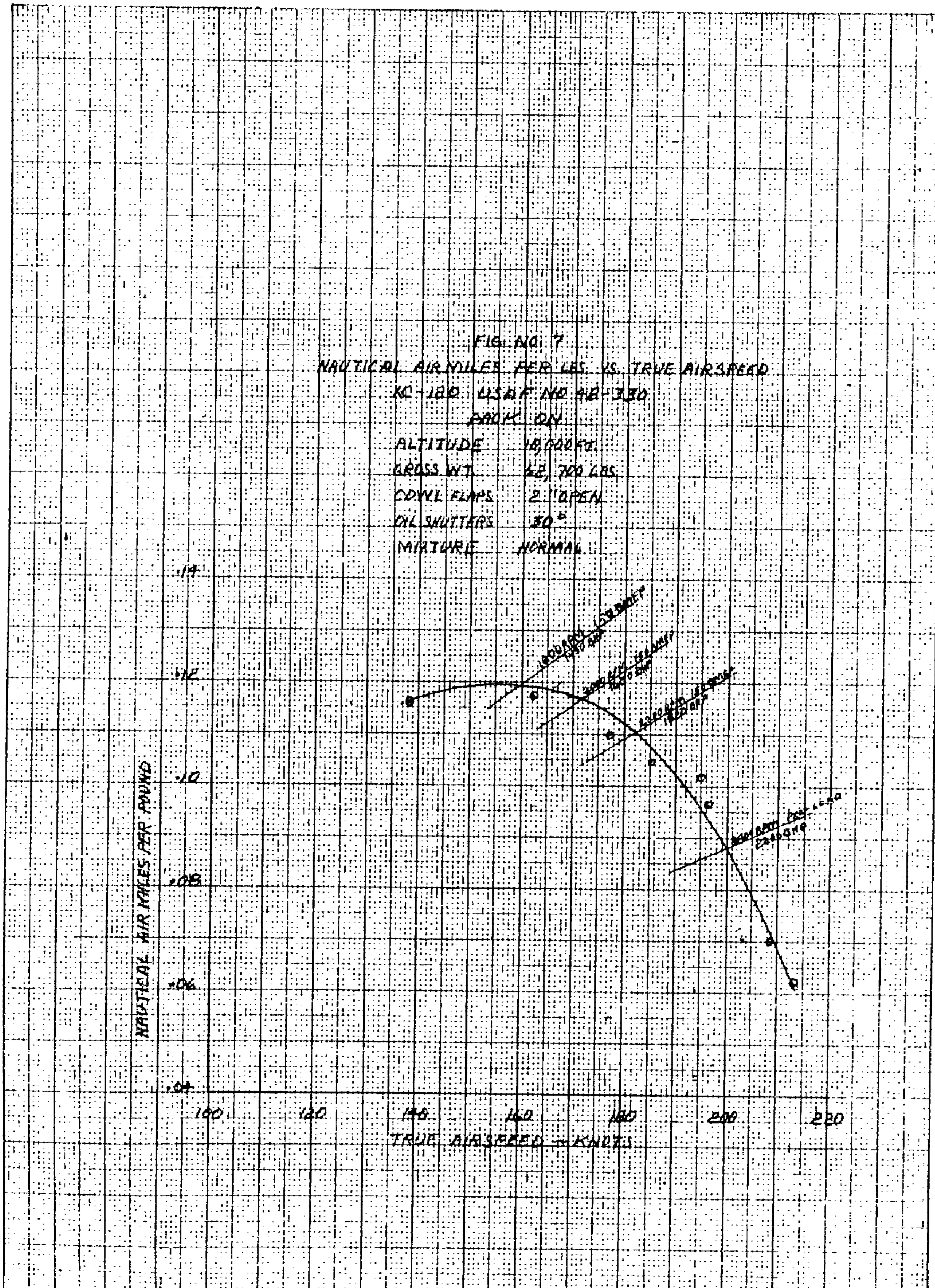


FIG. NO. 7
NAUTICAL AIR MILES PER LBS. VS. TRUE AIRSPEED
ALTITUDE
GROSS WT.
COWL FLAPS
OIL SHUTTERS
MIXTURE NORMAL
NAUTICAL AIR MILES PER POUND
.14
.12
.10
.08
.06
.04
100
120
140
160
180
200
220
TRUE AIRSPEED ~ KNOTS

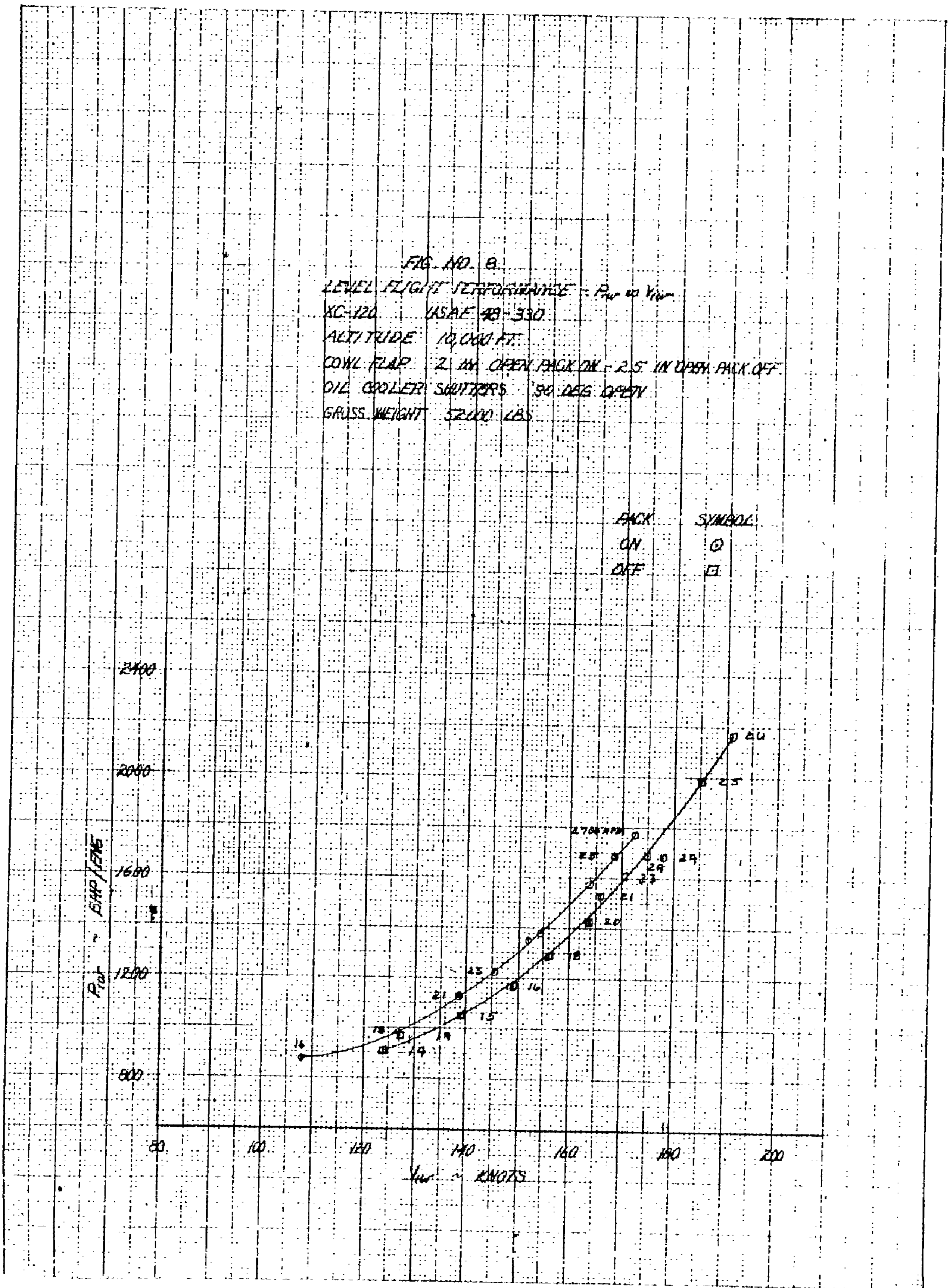


FIG. NO. 8
XC-120 USAF 48-330
ALTITUDE 10,000 FT.
COWL FLAP 2 IN. OPEN PACK ON - 2.5 IN OPEN PACK OFF
OIL COOLER SHUTTERS 30 DEG OPEN
GROSS WEIGHT 52000 LBS
PACK SYMBOL
ON
OFF
BHP/ENG
2400
2000
1600
1200
800
80
100
120
140
160
180
200
KNOTS
2700 RPM

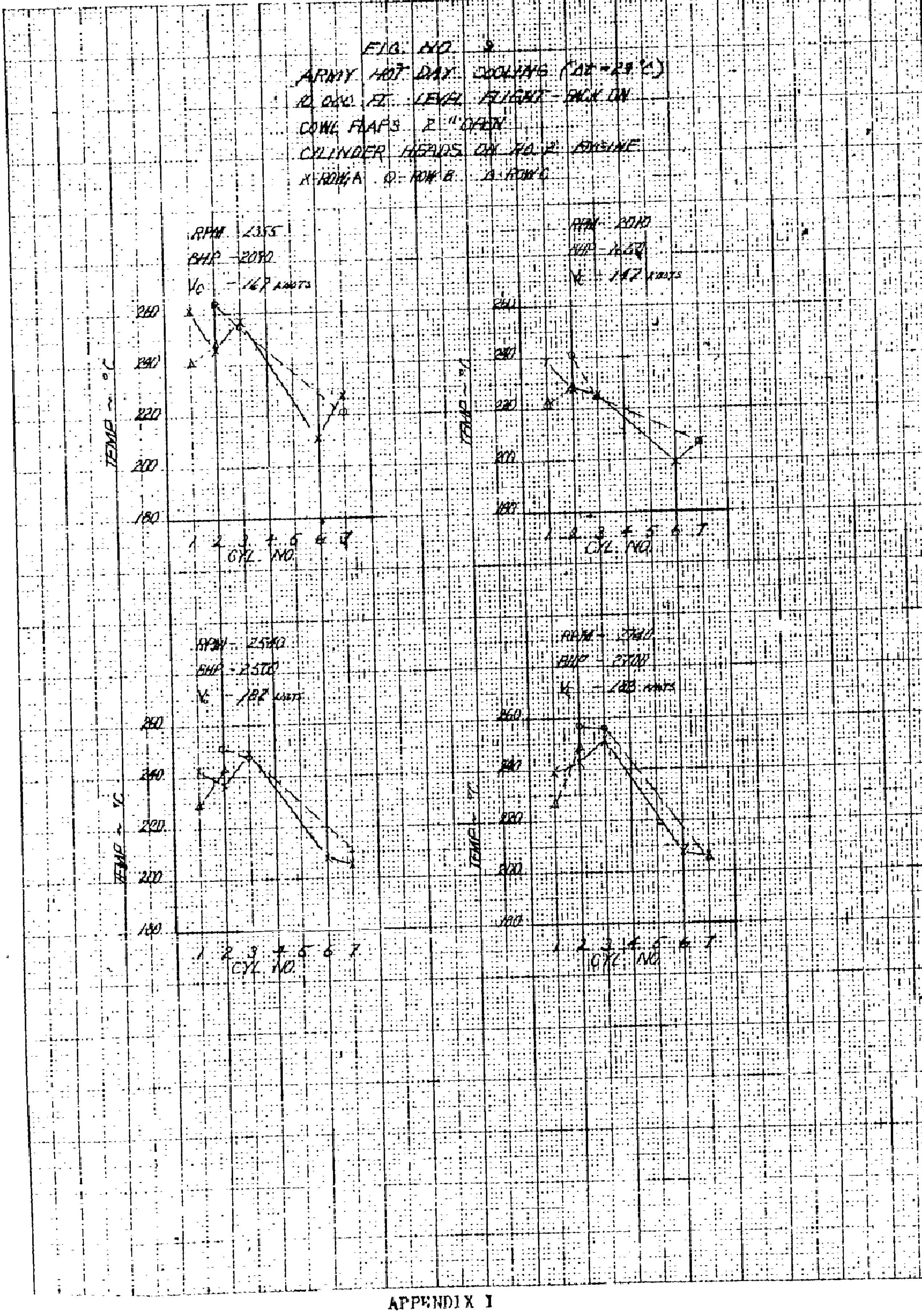


FIG. NO. 9
ARMY HOT DAY COOLING
10,000 FT. LEVEL FLIGHT
COWL FLAPS 2" OPEN
CYLINDER HEADS ON NO. 2 ENGINE
X-ROW A O-ROW B Δ-ROW C
RPM - 2355
TEMP ~ °C
CYL. NO.
RPM - 2540
BHP - 2500
TEMP ~ °C
CYL. NO.
TEMP
CYL. NO.
TEMP
CYL. NO.

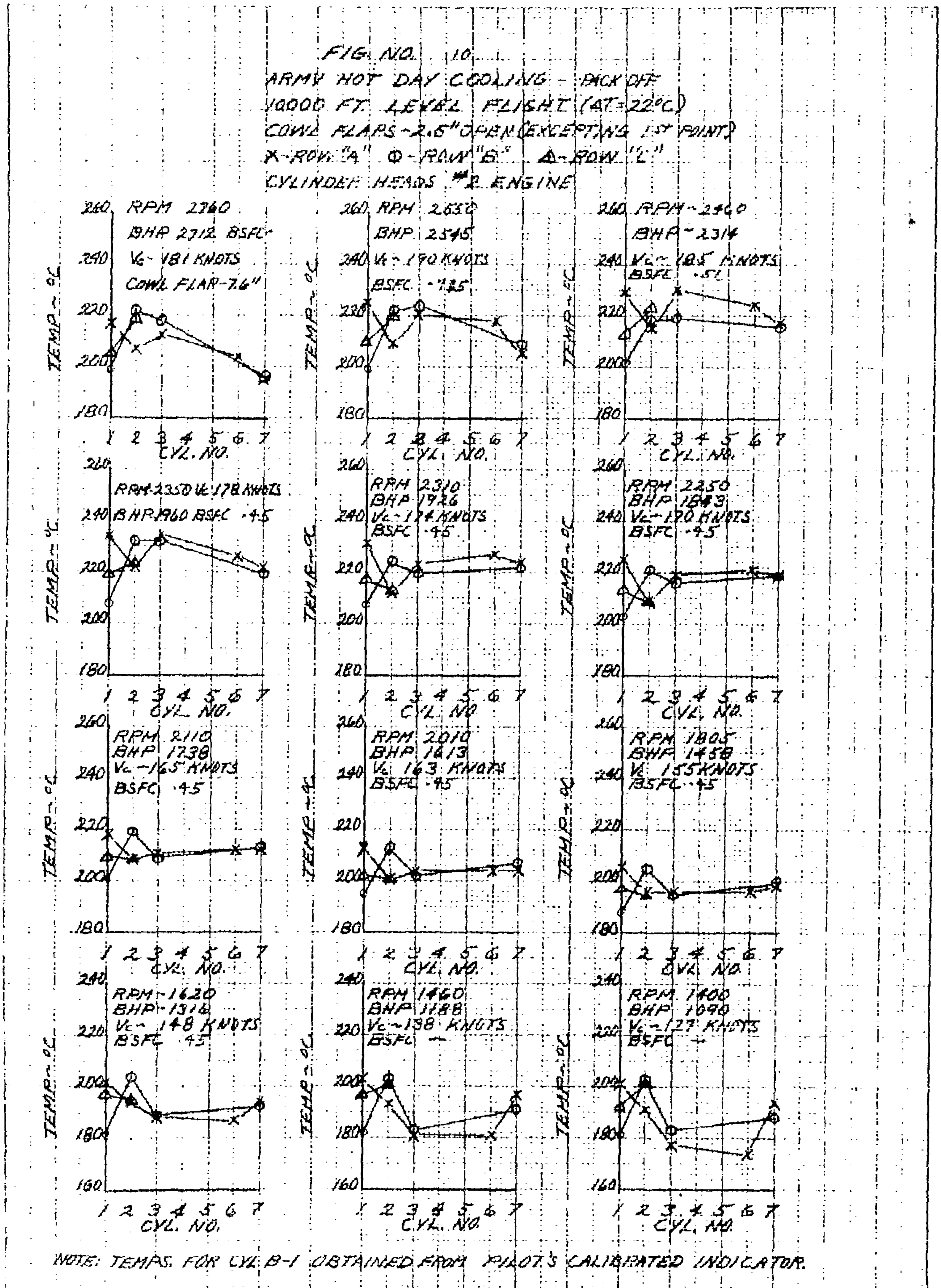


FIG. NO. 10
ARMY HOT DAY COOLING - PACK OFF
10000 FT. LEVEL FLIGHT (AT=22°C)
COWL FLAPS - 2.5" OPEN (EXCEPTING 1ST POINT)
X - ROW "A" Φ - ROW "B" Δ - ROW "C"
CYLINDER HEADS #2 ENGINE
RPM 2760
BHP 2712 BSFC
Vc - 181 KNOTS
COWL FLAP - 7.6"
RPM 2650
BHP 2545
Vc - 190 KNOTS
BSFC .125
RPM - 2460
BHP - 2314
Vc - 185 KNOTS
BSFC .5
RPM - 2350 Vc 178 KNOTS
BHP 1960 BSFC .45
RPM 2310
BHP 1926
Vc - 174 KNOTS
BSFC .45
RPM 2250
BHP 1843
Vc - 170 KNOTS
BSFC .45
RPM 2110
BHP 1738
Vc - 165 KNOTS
BSFC .45
RPM 2010
BHP 1613
Vc 163 KNOTS
BSFC .45
RPM 1805
BHP 1458
Vc 155 KNOTS
BSFC .45
RPM - 1620
BHP - 1316
Vc - 148 KNOTS
BSFC .45
RPM 1460
BHP 1188
Vc - 138 KNOTS
BSFC -
RPM 1400
BHP 1090
Vc - 127 KNOTS
BSFC -
TEMP - °C
CYL. NO.
NOTE: TEMPS. FOR CYL B-1 OBTAINED FROM PILOT'S CALIBRATED INDICATOR.

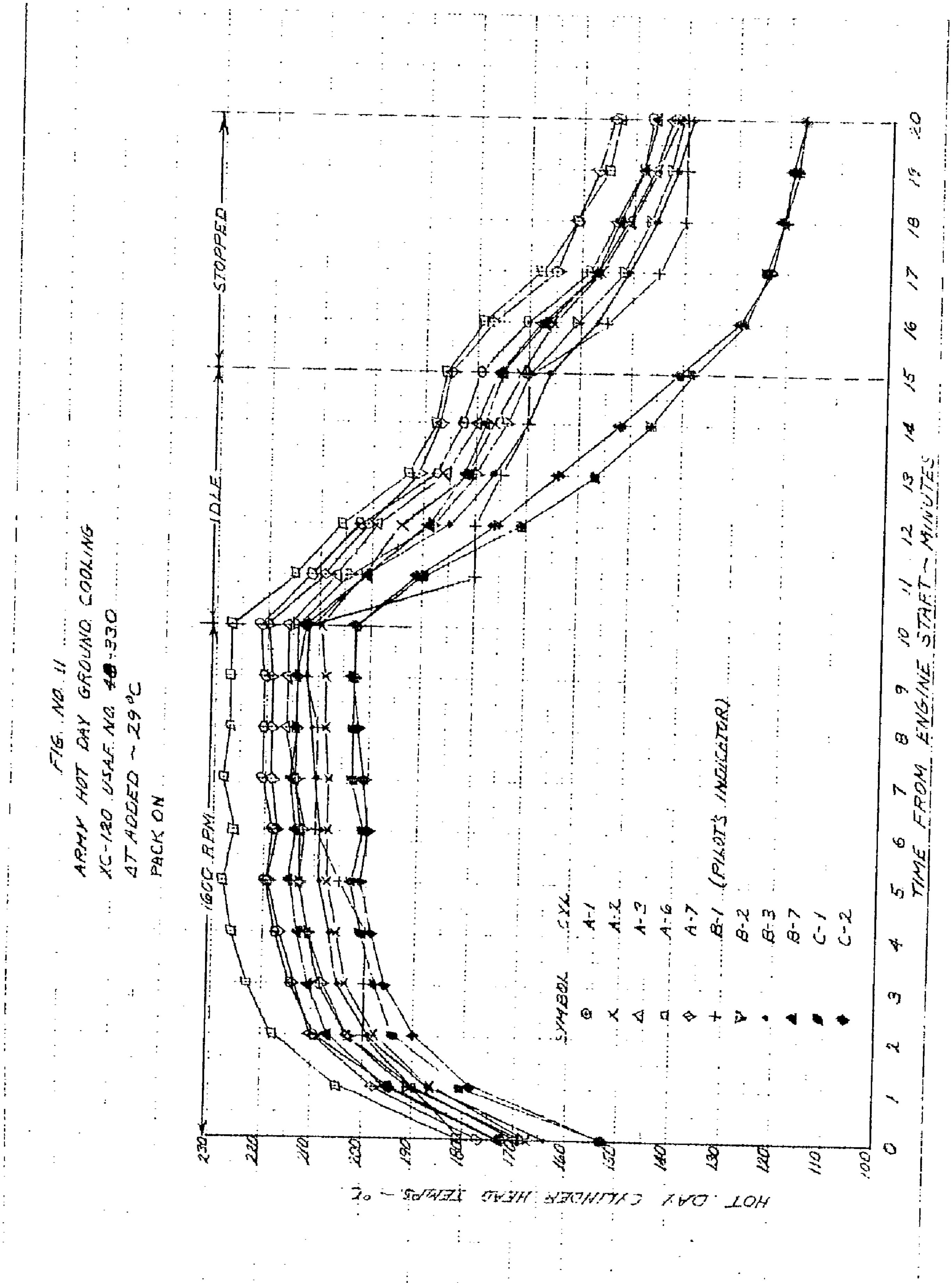


FIG. NO. 11
ARMY HOT DAY GROUND COOLING
XC-120 USAF NO.
ΔT ADDED ~ 29°C
PACK ON
1600 RPM
IDLE
STOPPED
SYMBOL CYL.
A-1
A-2
A-3
A-6
A-7
B-1 (PILOT'S INDICATOR)
B-2
B-3
B-7
C-1
C-2
HOT DAY CYLINDER HEAD TEMPS. ~ °C
TIME FROM ENGINE START ~ MINUTES

FIG. NO. 12

AIRSPEED POSITION ERROR CORRECTION

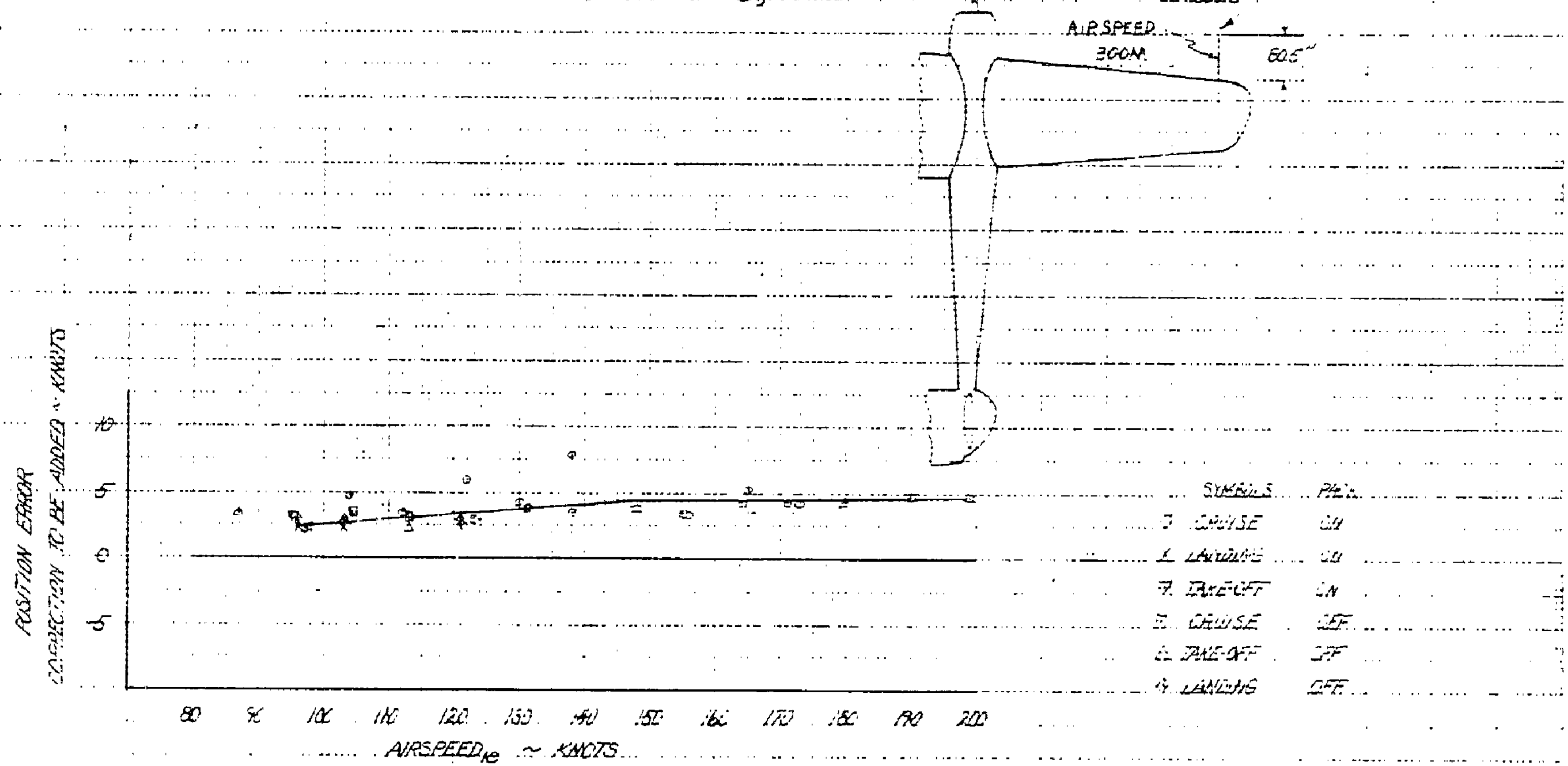
SWIVEL SYSTEM

XC-120 USAF NO. 48-330

PACED BY F-51, USAF NO. 5479

GROSS WT. PACK ON 61,000 LBS.

GROSS WT. PACK OF 51,000 LBS.



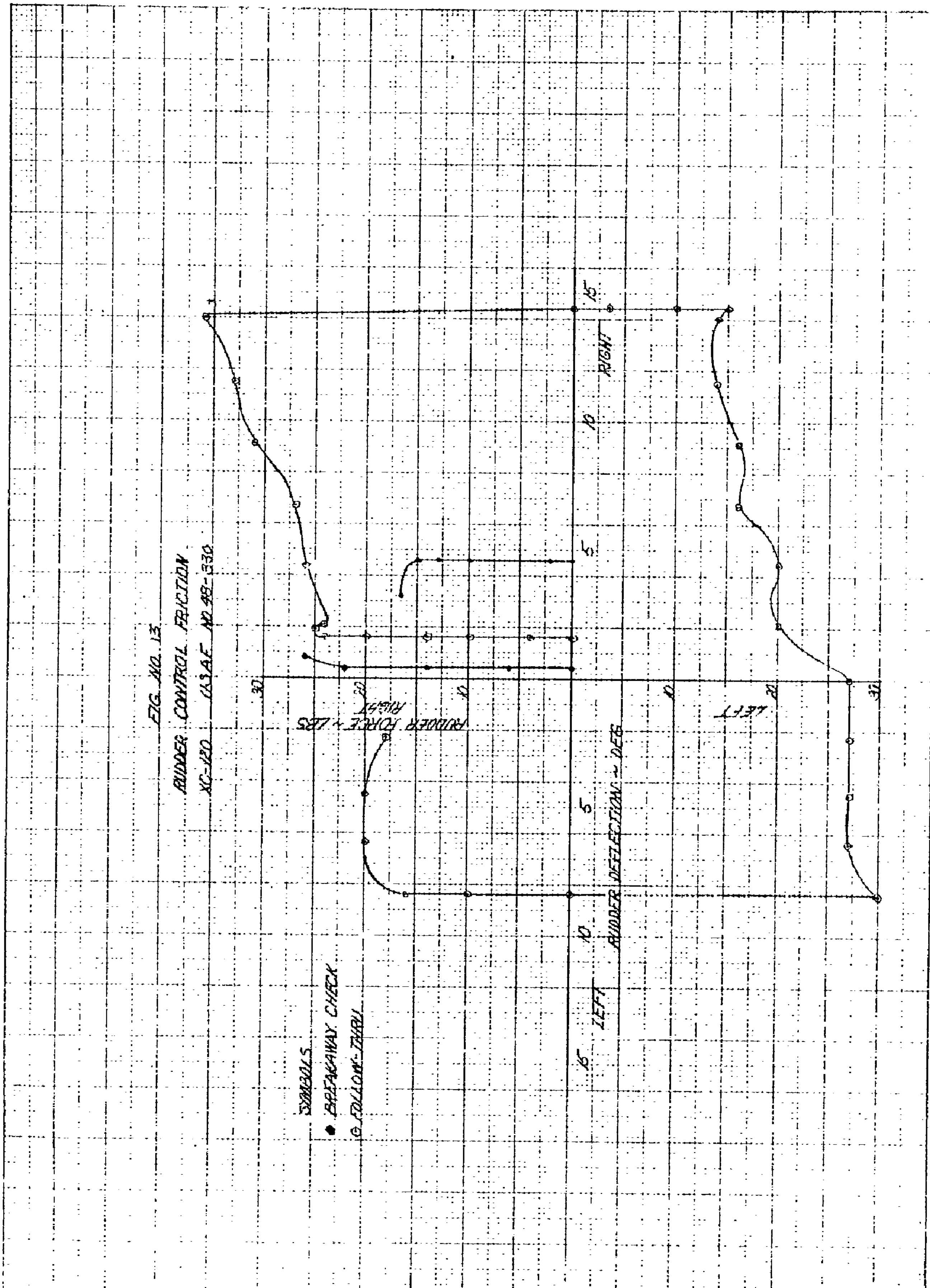


FIG. NO. 13
RUDDER CONTROL FRICTION
XC-120 U.S.A.F. NO 48-330
RUDDER FORCE ~ LBS
RIGHT
LEFT
RUDDER DEFLECTION ~ DEG
SYMBOLS
BREAKAWAY CHECK
FOLLOW-THRU

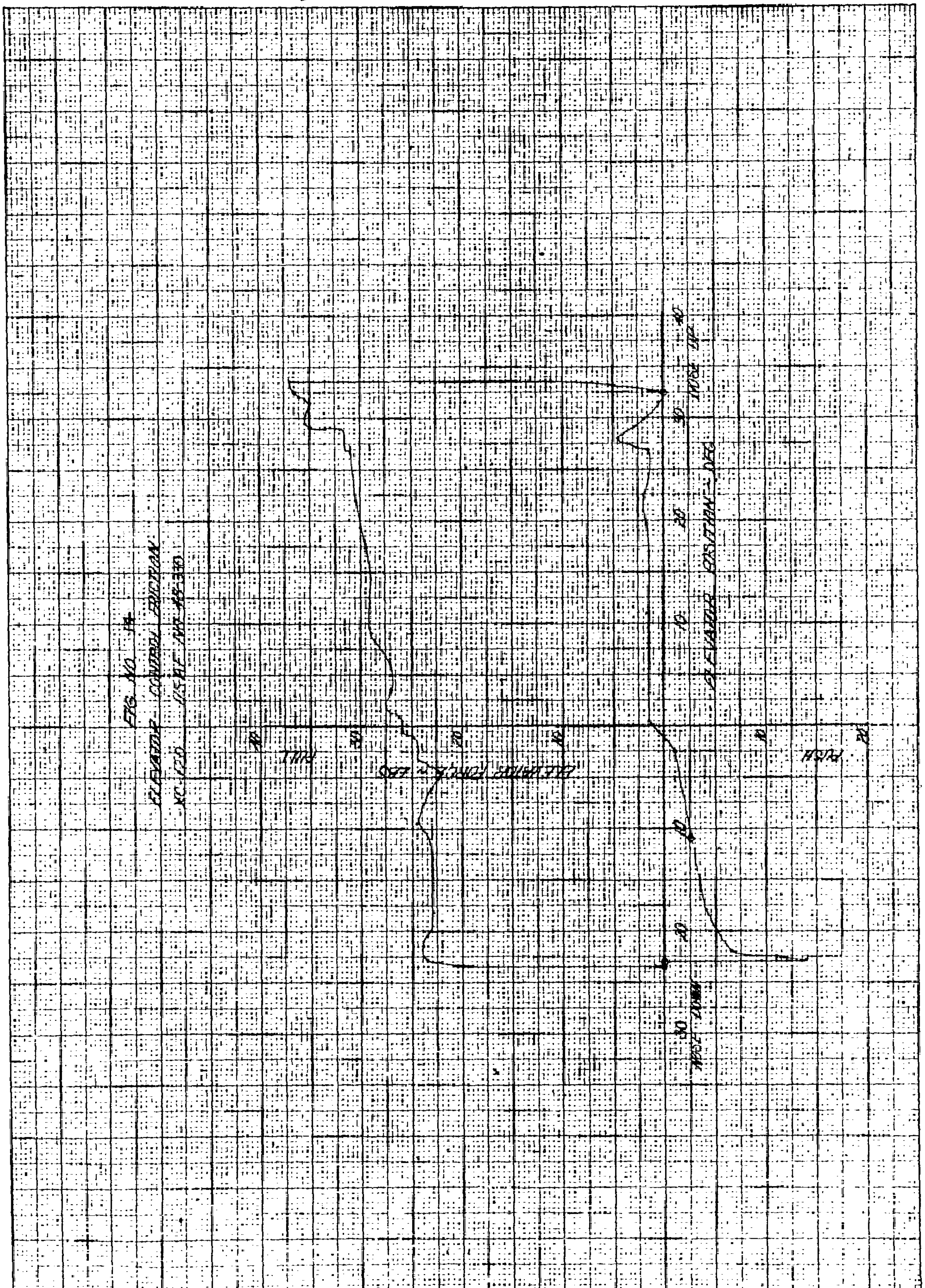


FIG NO 14
ELEVATOR CONTROL FRICTION
ELEVATOR POSITION - DEG
NOSE UP
NOSE DOWN
PULL
PUSH
10
20
30
40

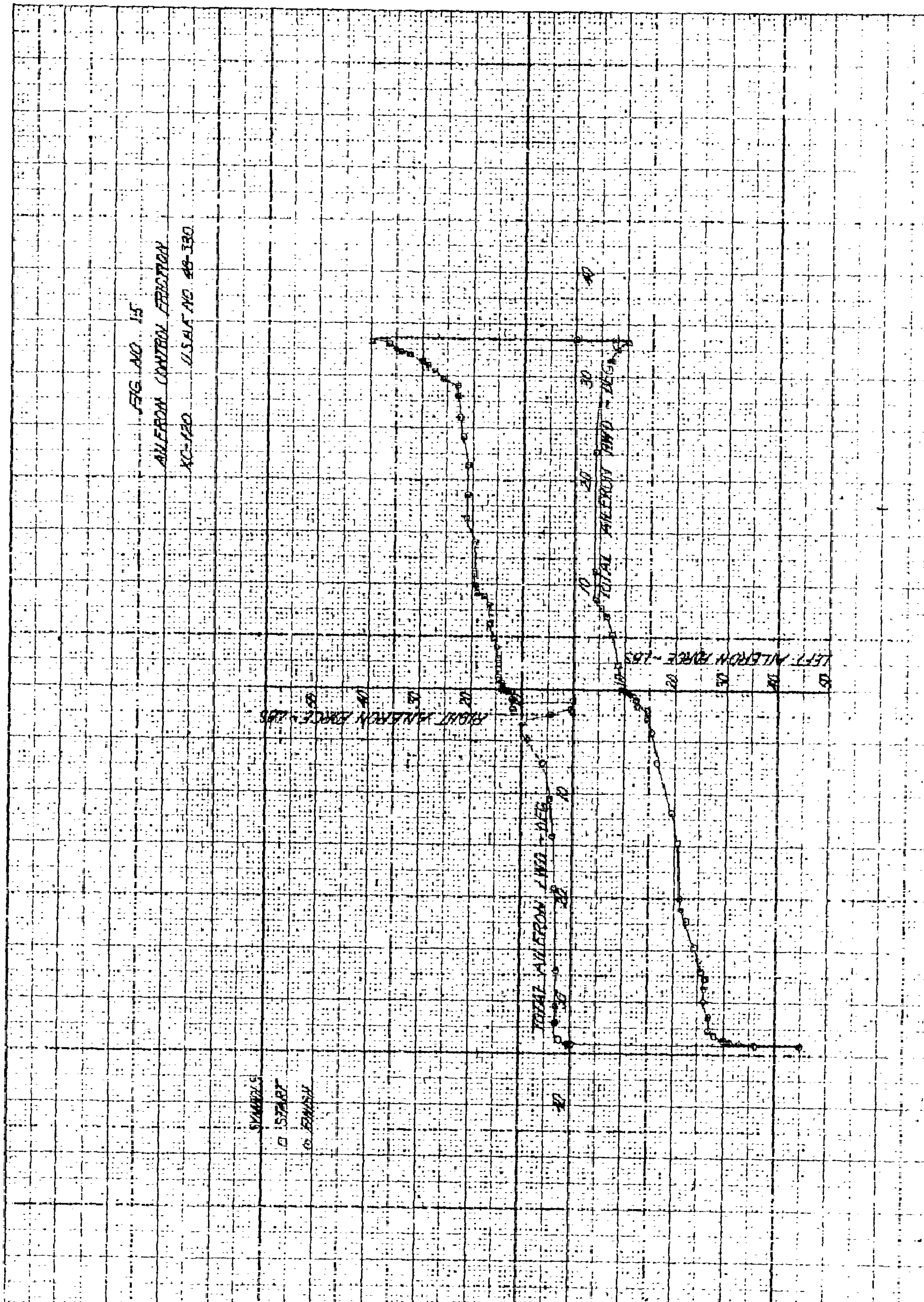
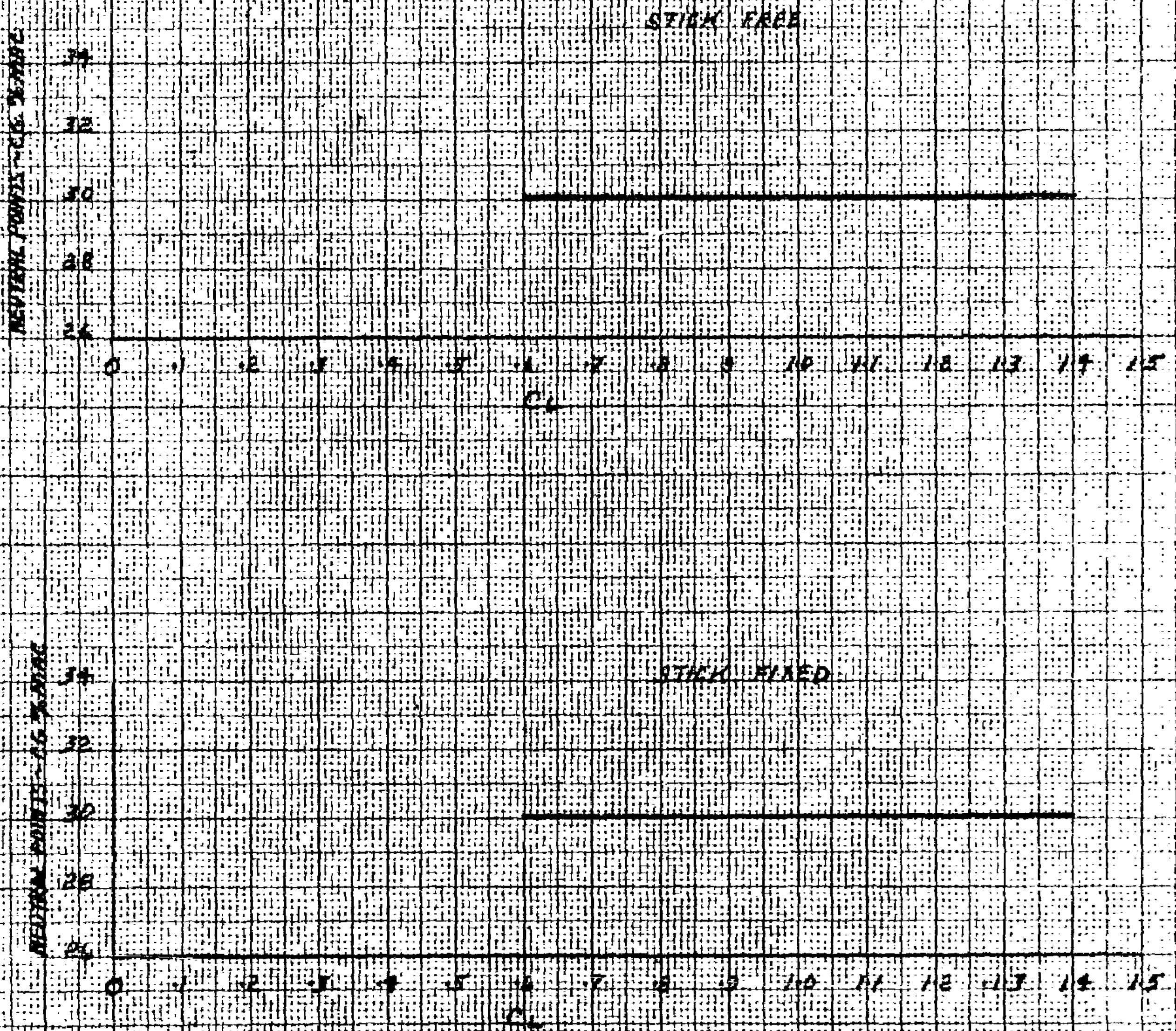


FIG. NO. 15
AILERON CONTROL FRICTION
XC-120 U.S.A.F. NO 48-330
SYMBOLS
□ START
○ FINISH
TOTAL AILERON MVD - DEG.
LEFT AILERON FORCE ~LBS
RIGHT AILERON FORCE ~LBS
TOTAL AILERON LWD - DEG.

APPENDIX I

FIG. NO. 16
STATIC LONGITUDINAL STABILITY
NEUTRAL POINTS
CRUISE CONFIGURATION
XC-120 USAF NO. 48-330
PACK ON



APPENDIX I

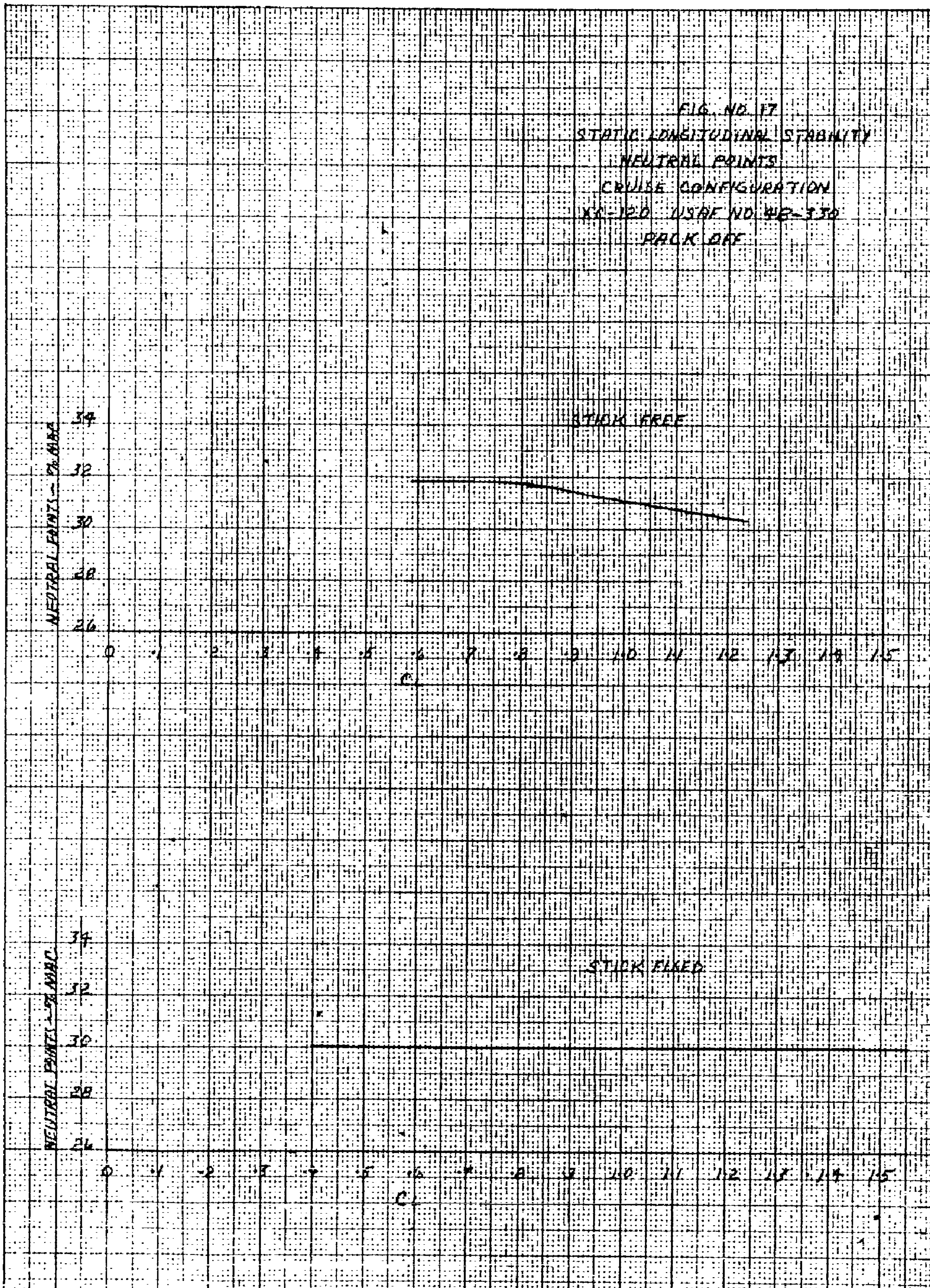


FIG. NO. 17
STATIC LONGITUDINAL STABILITY
NEUTRAL POINTS
CRUISE CONFIGURATION
STICK FREE
STICK FIXED
NEUTRAL POINTS - % MAC
C_L

APPENDIX I

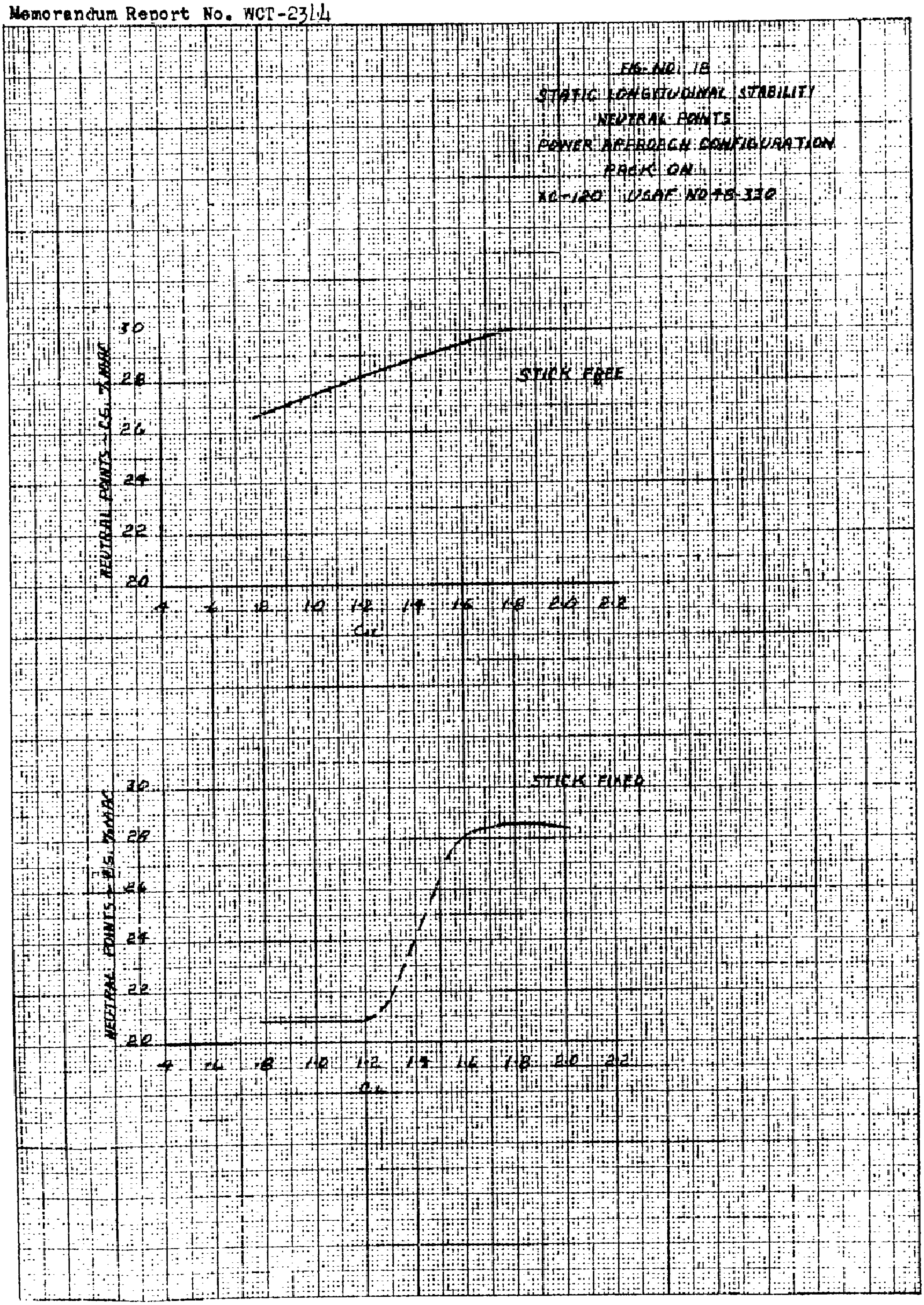


FIG. NO. 18
STATIC LONGITUDINAL STABILITY
NEUTRAL POINTS
POWER APPROACH CONFIGURATION
PROP ON
XC-120 USAF NO 48-330
STICK FREE
NEUTRAL POINTS - C.G. % MAC
30
28
26
24
22
20
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
C_L
STICK FIXED
NEUTRAL POINTS - C.G. % MAC
30
28
26
24
22
20
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
C_L

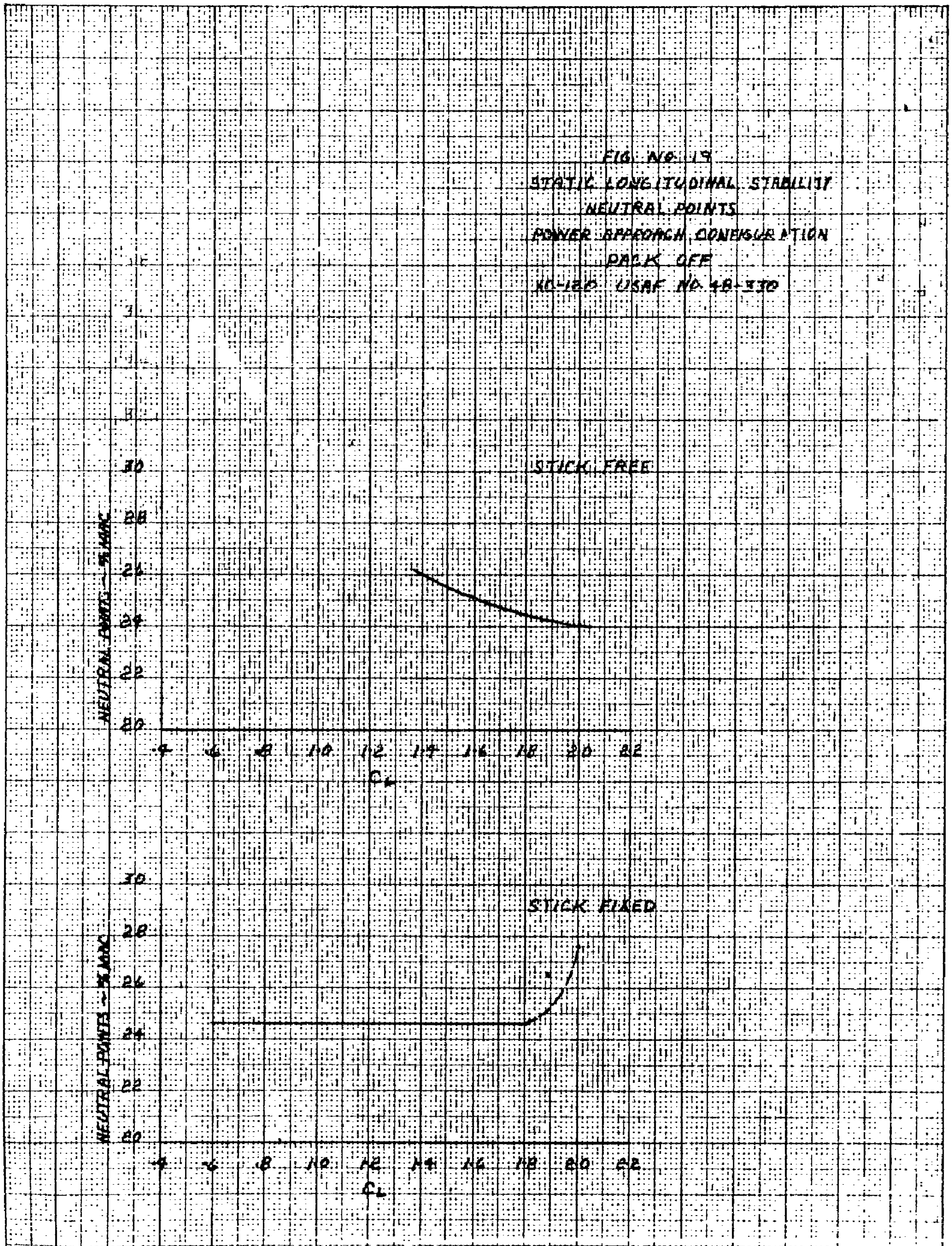
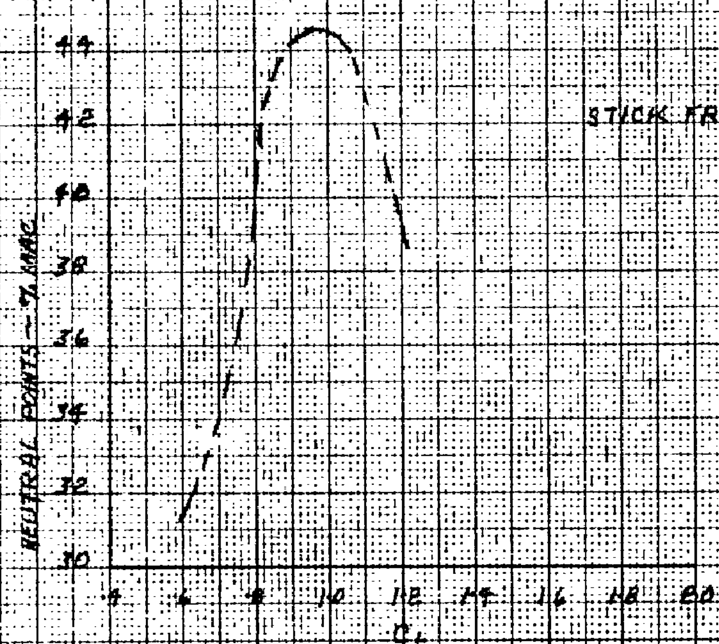
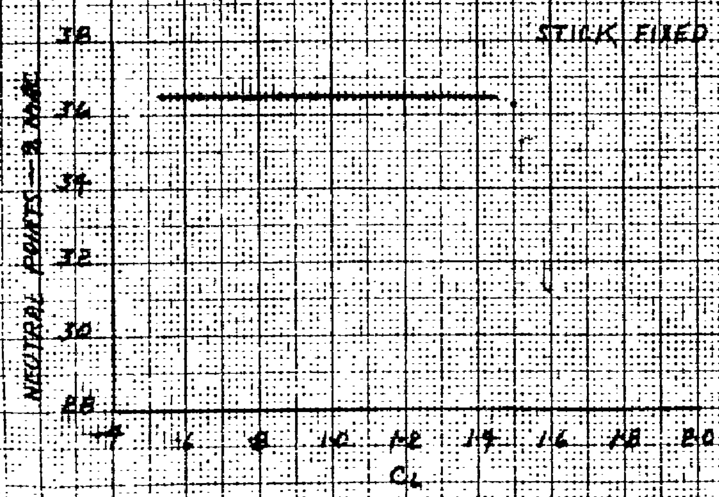


FIG. NO. 19
STATIC LONGITUDINAL STABILITY
NEUTRAL POINTS
POWER APPROACH CONFIGURATION
PACK OFF
XC-120 USAF NO. 48-330
STICK FREE
NEUTRAL POINTS ~ % MAC
30
28
26
24
22
20
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
C_L
STICK FIXED
NEUTRAL POINTS ~ % MAC
30
28
26
24
22
20
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
C_L

FIG. NO. 20
STATIC LONGITUDINAL STABILITY
NEUTRAL POINTS
LANDING CONFIGURATION
PACK OFF
XC-120 USAF NO. 48-330





APPENDIX I

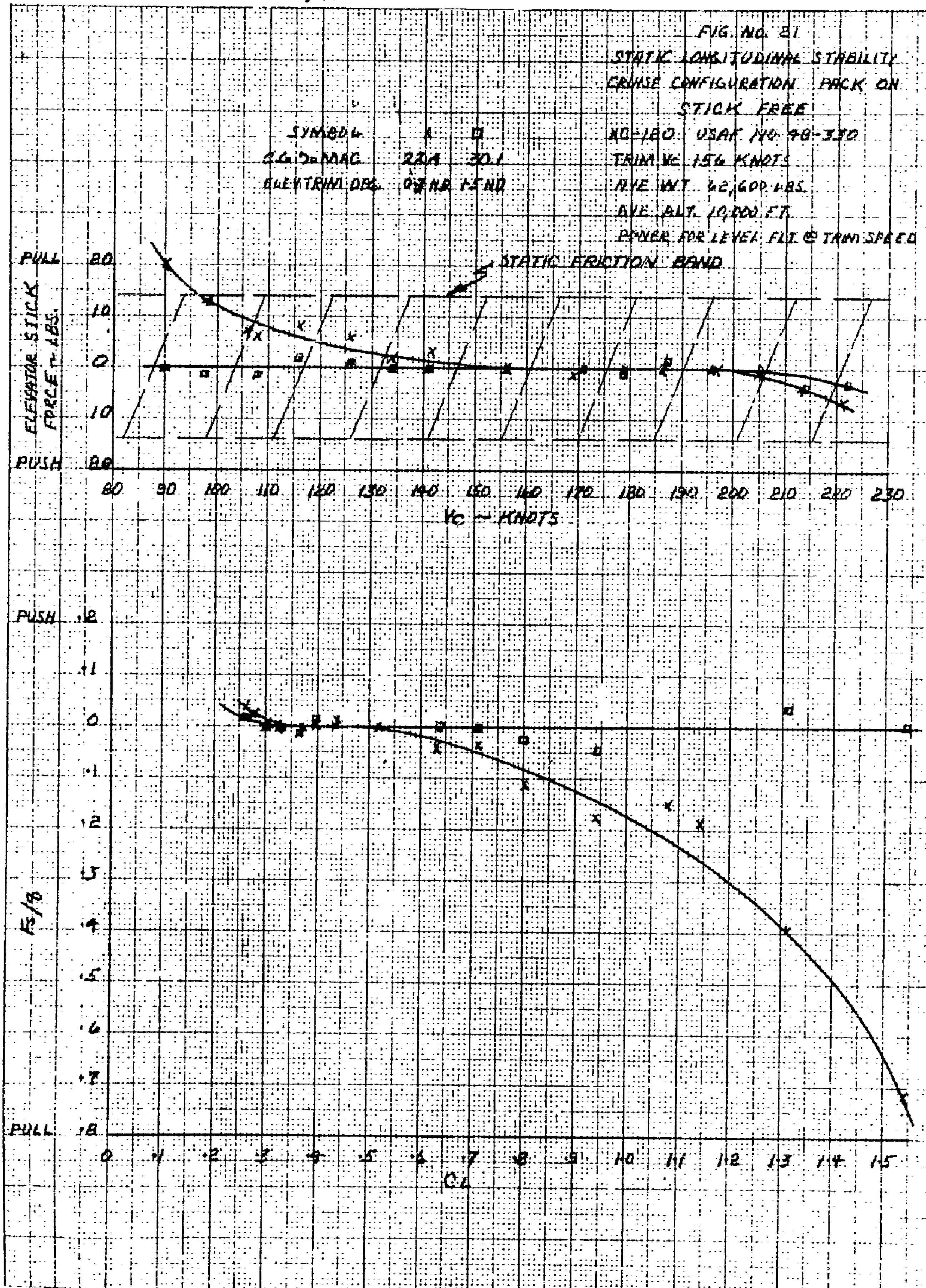


FIG. NO. 21
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION PACK ON
STICK FREE
XC-120 USAF NO. 48-330
TRIM Vc 156 KNOTS
AVE. WT. 62,600 LBS.
AVE. ALT. 10,000 FT.
POWER FOR LEVEL FLT. @ TRIM SPEED
SYMBOL x □
C.G. % MAC 22.4 30.1
ELEV. TRIM DEG.
STATIC FRICTION BAND
PULL
PUSH
ELEVATOR STICK FORCE ~ LBS.
20
10
0
10
20
80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230
Vc ~ KNOTS
PUSH
.2
.1
0
.1
.2
.3
.4
.5
.6
.7
.8
PULL
Fs/q
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
CL

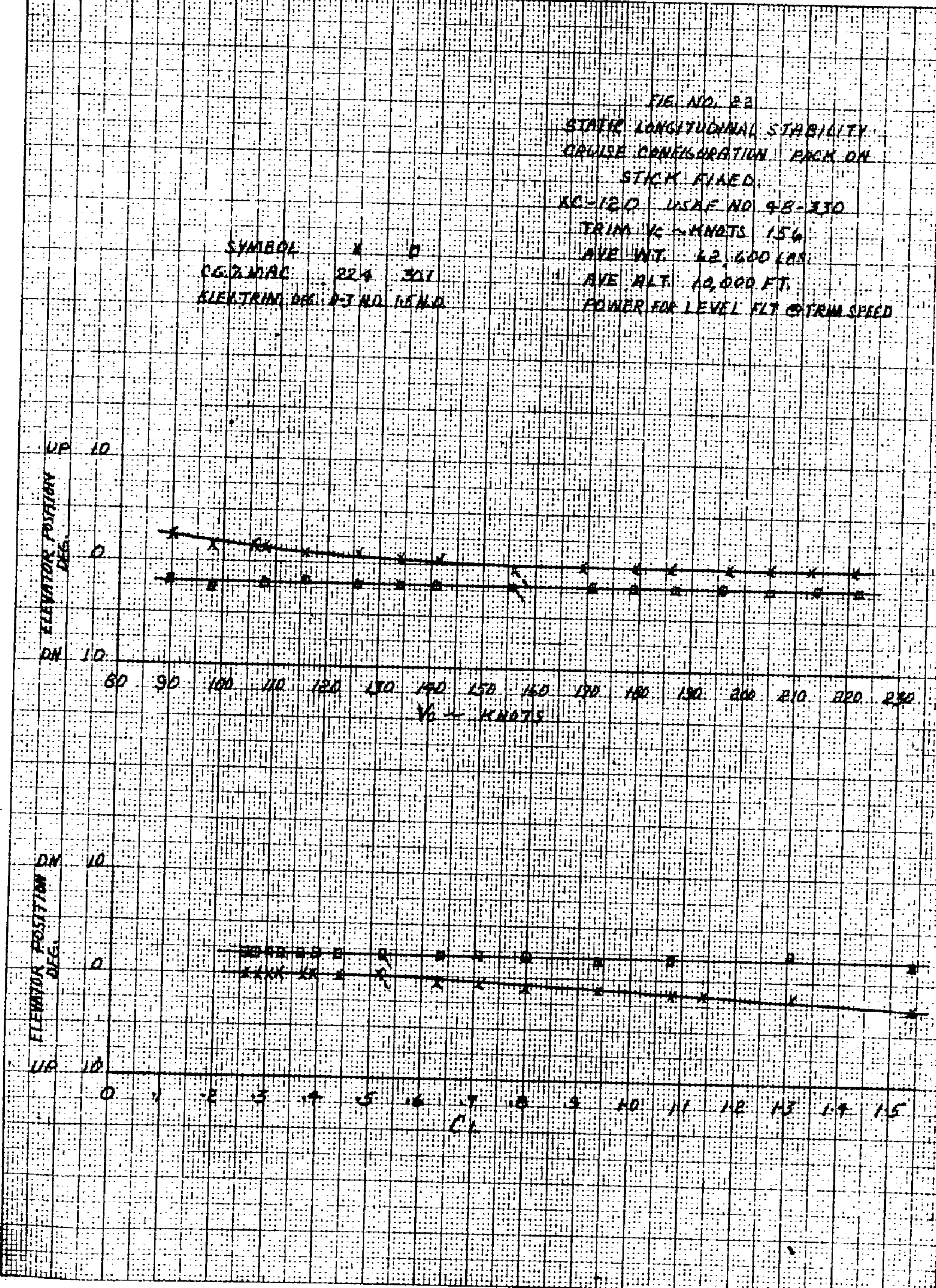


FIG. NO. 22
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION PACK ON
STICK FIXED
XC-120 USAF NO 48-330
TRIM Vc ~ KNOTS 156
AVE WT. 42,600 LBS.
AVE ALT. 10,000 FT.
POWER FOR LEVEL FLT @ TRIM SPEED
SYMBOL X □
C.G. % MAC 22.4 30.1
ELEV. TRIM DEG.
UP 10
0
DN 10
ELEVATOR POSITION DEG.
80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230
Vc ~ KNOTS
DN 10
0
UP 10
ELEVATOR POSITION DEG.
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
CL

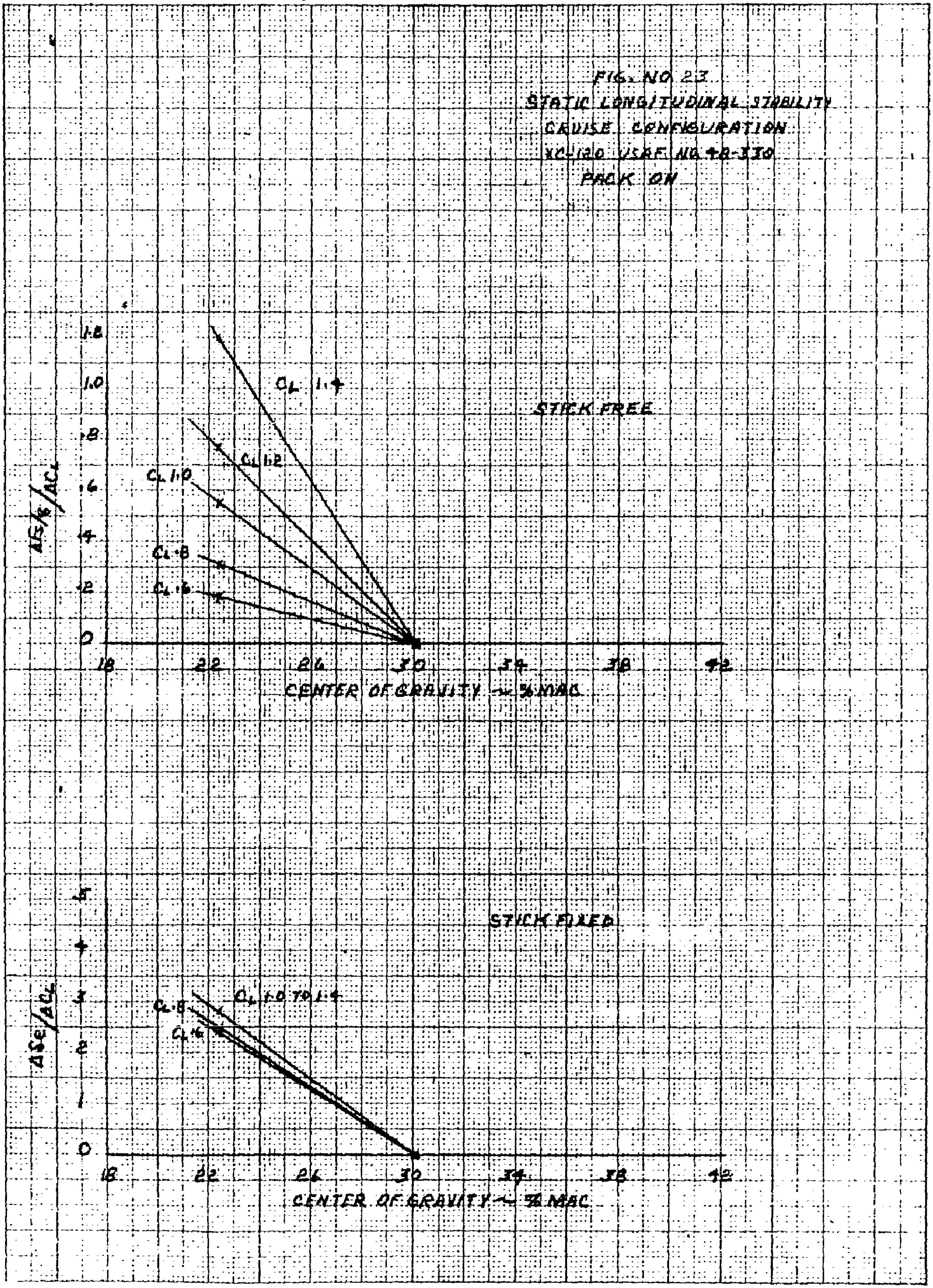


FIG. NO. 23
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION
XC-120 USAF NO 48-330
PACK ON
STICK FREE
$\Delta F_s/\delta / \Delta C_L$
1.2
1.0
.8
.6
.4
.2
0
C_L 1.4
C_L 1.2
C_L 1.0
C_L .8
C_L .6
18
22
26
30
34
38
42
CENTER OF GRAVITY ~ % MAC
STICK FIXED
$\Delta \delta e / \Delta C_L$
5
4
3
2
1
0
C_L 1.0 TO 1.4
C_L .8
C_L .6
18
22
26
30
34
38
42
CENTER OF GRAVITY ~ % MAC

APPENDIX I

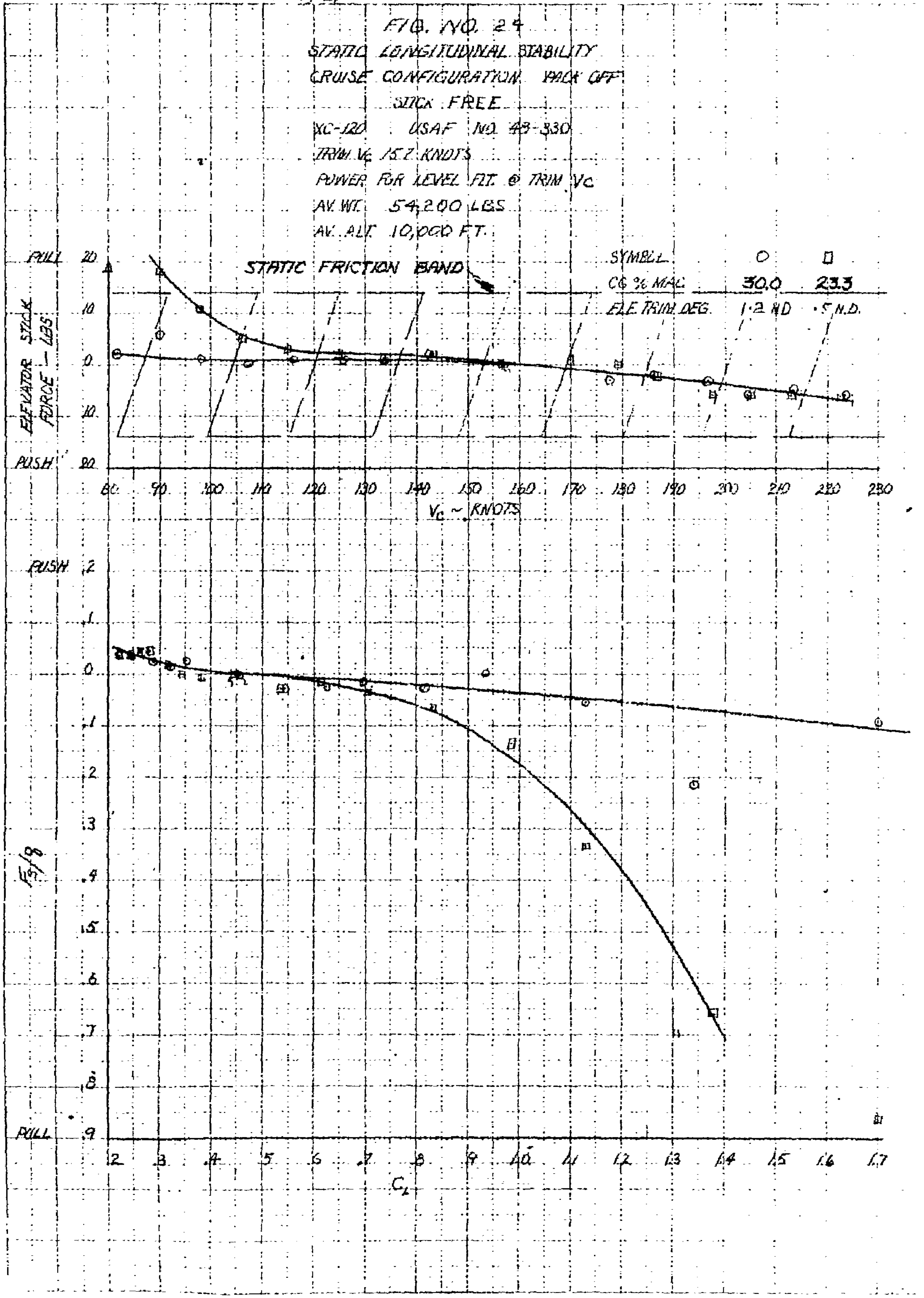


FIG. NO. 24
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION PACK OFF
STICK FREE
XC-120 USAF NO. 48-330
TRIM Vc 157 KNOTS
POWER FOR LEVEL FLT. @ TRIM Vc
AV. WT. 54,200 LBS
AV. ALT. 10,000 FT.
STATIC FRICTION BAND
SYMBOL ○ □
CG % MAC 30.0 23.3
ELE. TRIM DEG. 1.2 ND .5 N.D.
PULL
PUSH
ELEVATOR STICK FORCE — LBS
V_c ~ KNOTS
F_s/q
C_L

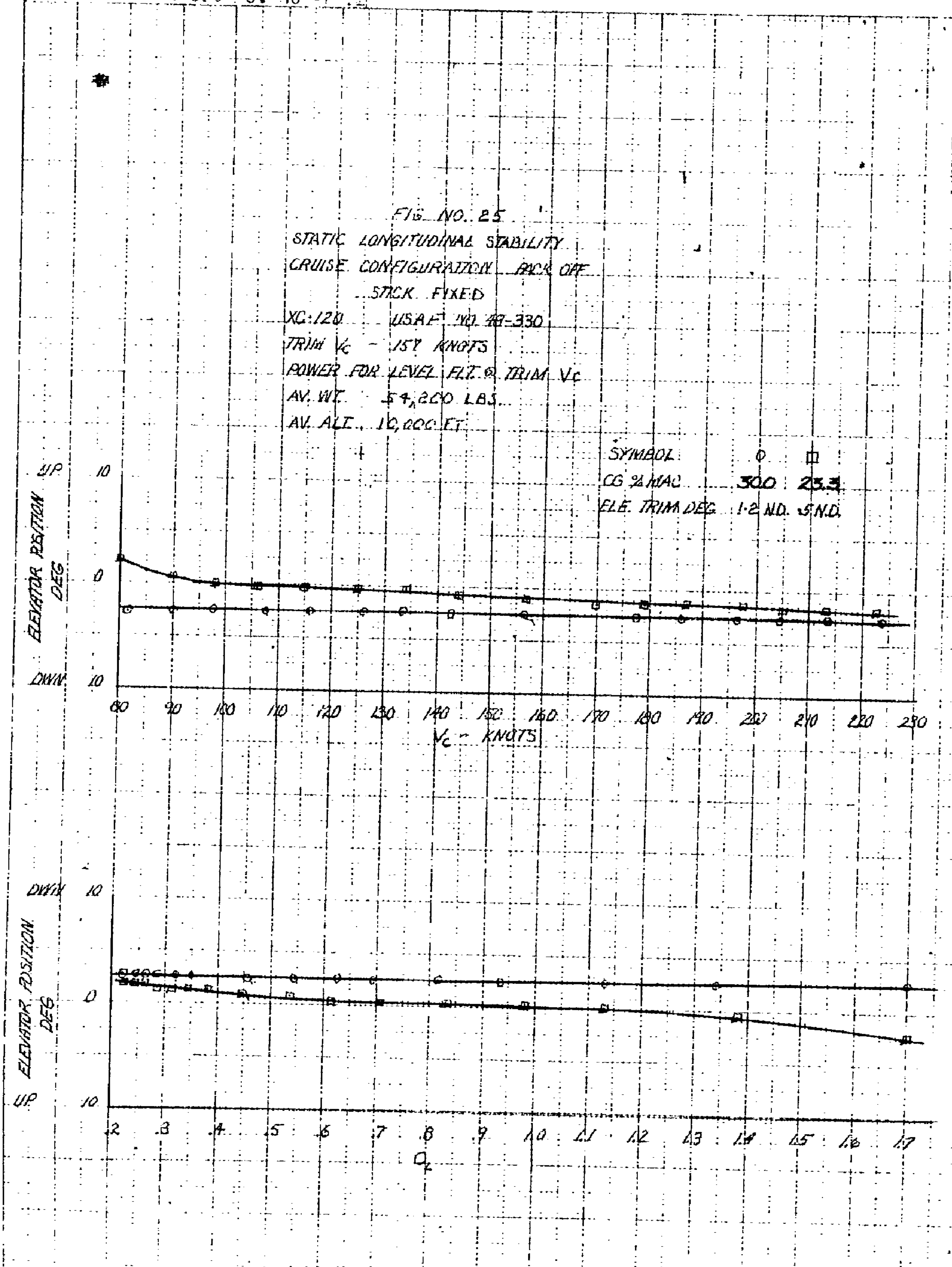


FIG. NO. 25
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION BACK OFF
STICK FIXED
XC-120 USAF NO. 48-330
TRIM Vc - 157 KNOTS
POWER FOR LEVEL FLT @ TRIM Vc
AV. WT. 54,200 LBS.
AV. ALT. 10,000 FT.
SYMBOL ○ □
CG % MAC 30.0 23.3
ELE. TRIM DEG 1.2 ND. .5 N.D.
UP 10
ELEVATOR POSITION DEG
0
DWN 10
80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230
Vc - KNOTS
DWN 10
ELEVATOR POSITION DEG
0
UP 10
.2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7
a

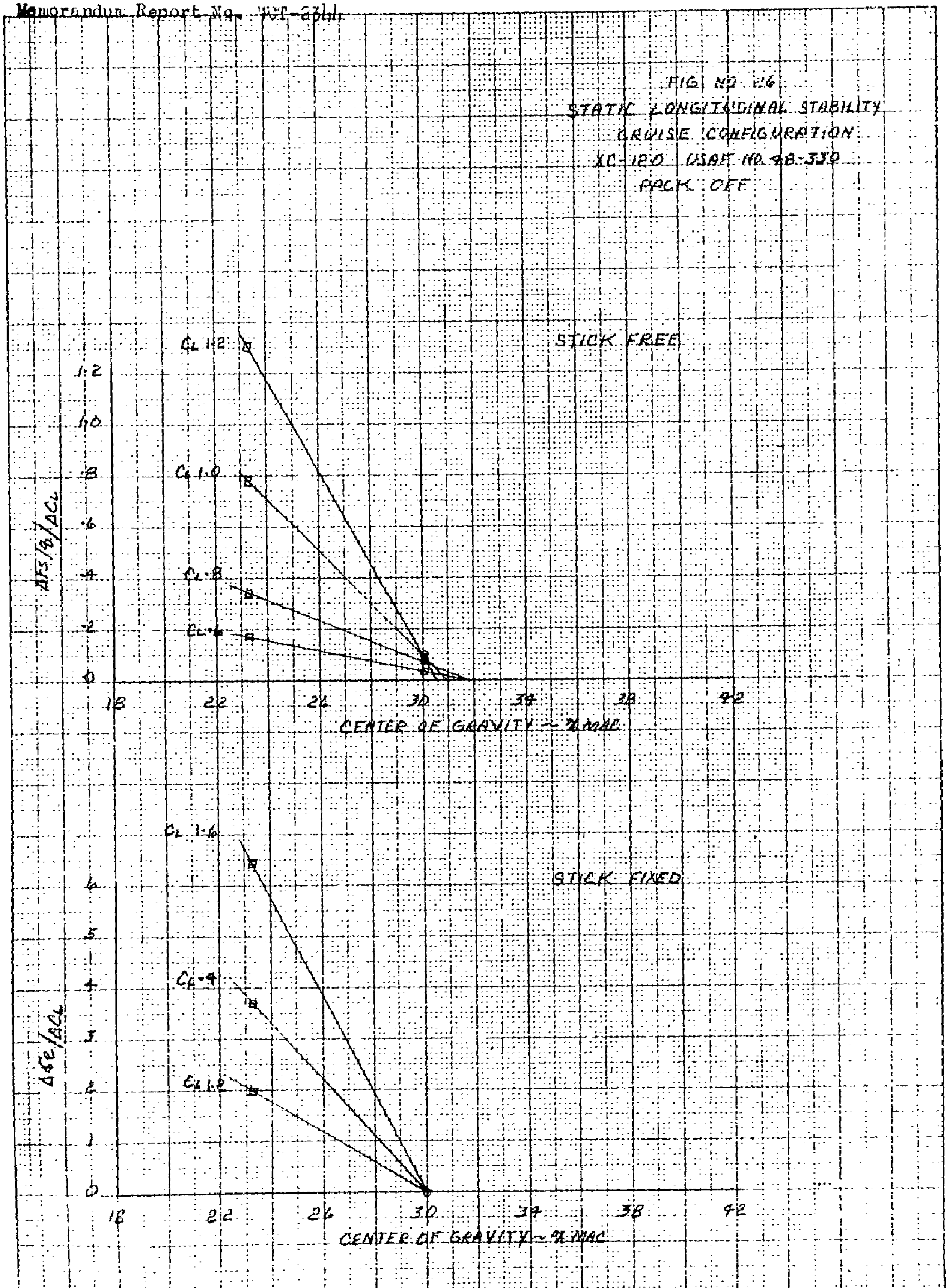


FIG NO 26
STATIC LONGITUDINAL STABILITY
CRUISE CONFIGURATION
XC-120 USAF NO 48-330
PACK OFF
STICK FREE
C_L 1.2
C_L 1.0
C_L .8
C_L .6
$\Delta F_S/B/\Delta C_L$
1.2
1.0
.8
.6
.4
.2
0
18
22
26
30
34
38
42
CENTER OF GRAVITY ~ % MAC
STICK FIXED
C_L 1.6
C_L .4
C_L 1.0
$\Delta \delta e/\Delta C_L$
6
5
4
3
2
1
0
18
22
26
30
34
38
42
CENTER OF GRAVITY ~ % MAC

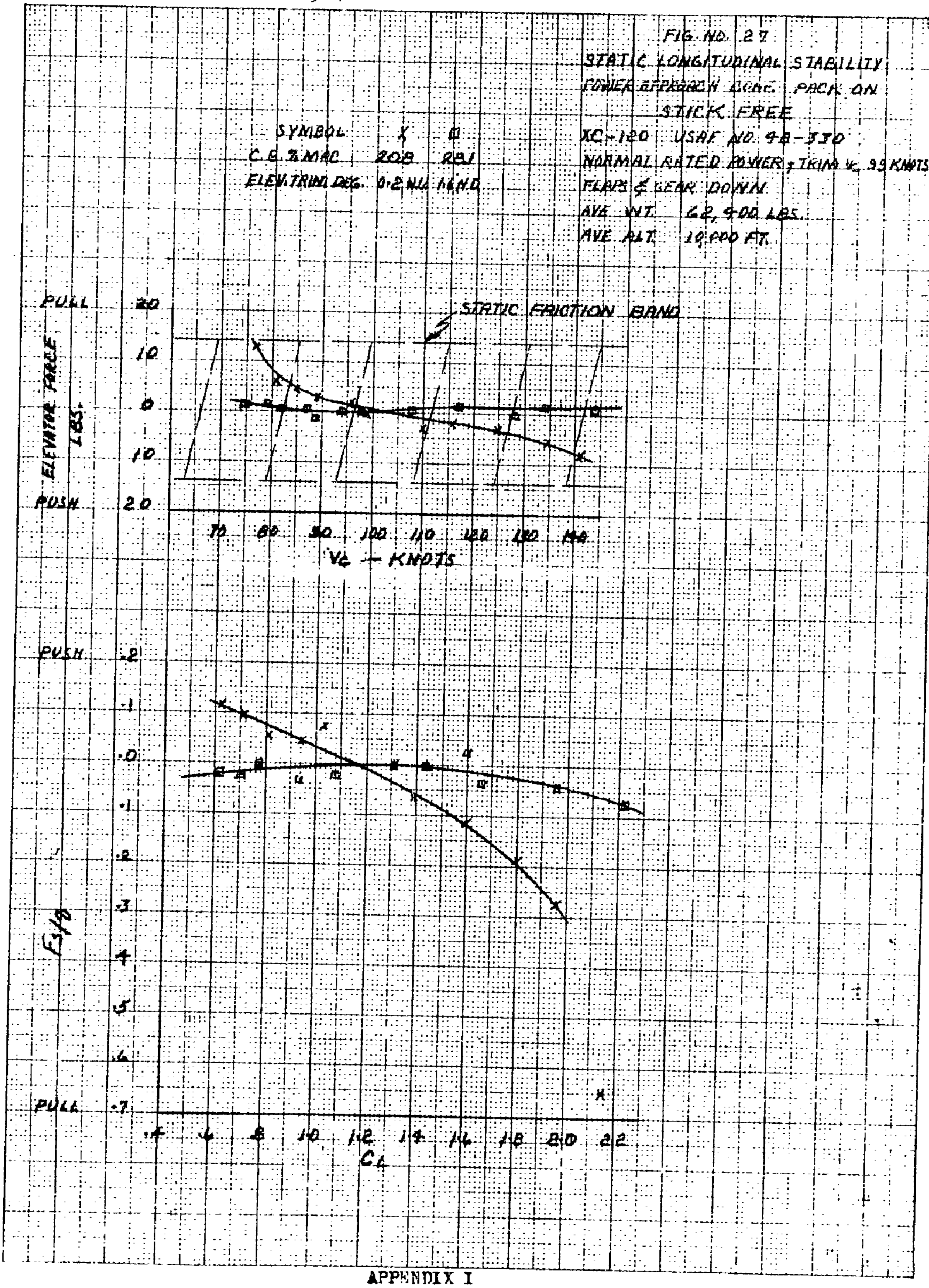


FIG. NO. 27
STATIC LONGITUDINAL STABILITY
POWER APPROACH COND. PACK ON
STICK FREE
XC-120 USAF NO. 48-330
NORMAL RATED POWER; TRIM V_c 95 KNOTS
FLAPS & GEAR DOWN
AVE WT. 62,400 LBS.
AVE ALT. 10,000 FT.
SYMBOL X ◻
C.G. % MAC 20.8 28.1
ELEV. TRIM DEG. 0.2 NU 1.6 NU
STATIC FRICTION BAND
PULL
PUSH
ELEVATOR FORCE LBS.
V_c — KNOTS
F_s/q
C_L

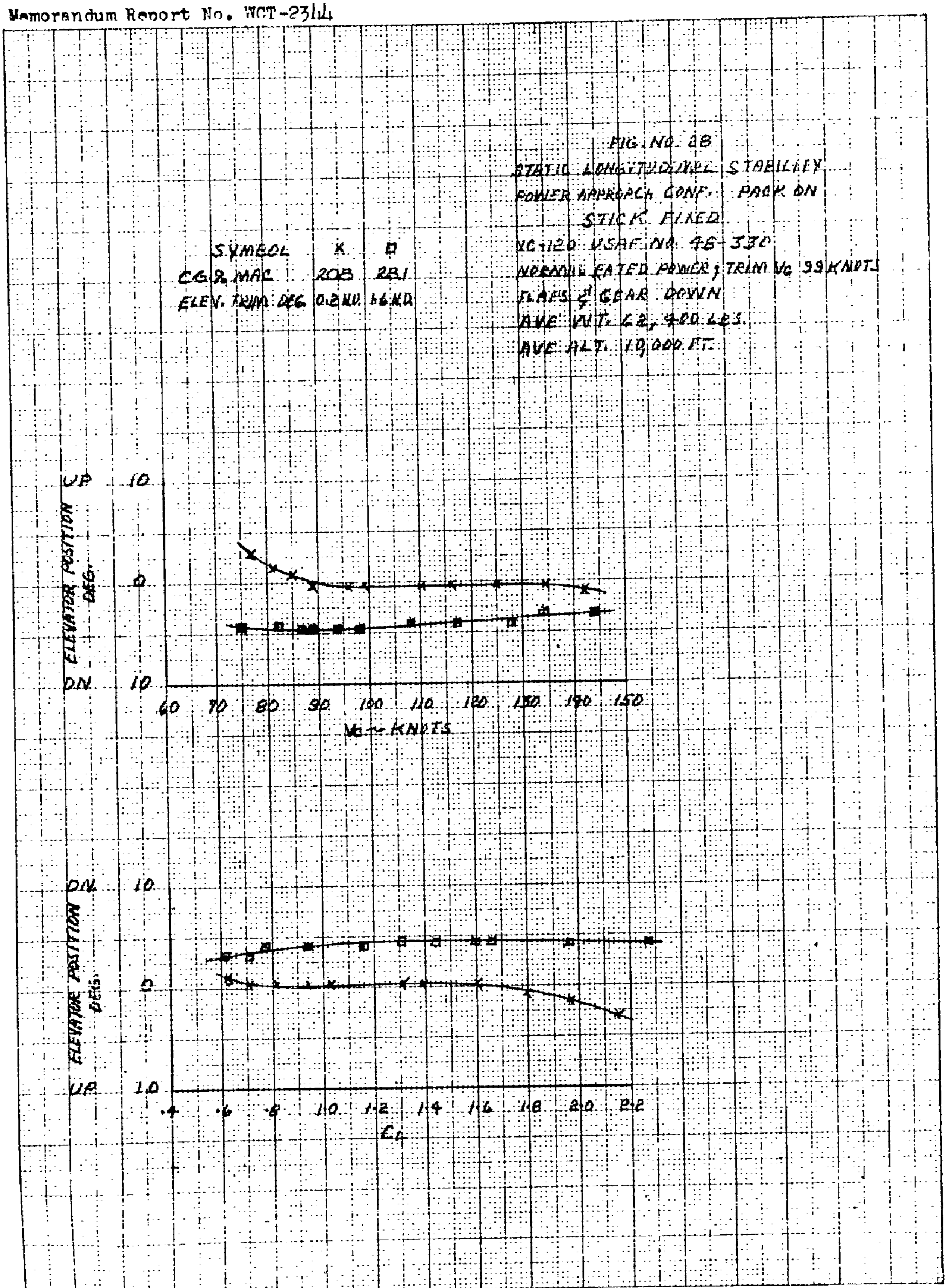


FIG. NO. 28
STATIC LONGITUDINAL STABILITY
POWER APPROACH CONF. PACK ON
STICK FIXED
YC-120 USAF NO. 48-330
NORMAL RATED POWER; TRIM Vc 99 KNOTS
FLAPS & GEAR DOWN
AVE WT. 62,400 LBS.
AVE ALT. 10,000 FT.
SYMBOL X □
CG % MAC 20.8 28.1
ELEV. TRIM DEG 0.2 UP 1.6 DN
UP 10
ELEVATOR POSITION DEG.
0
DN 10
60 70 80 90 100 110 120 130 140 150
Vc ~ KNOTS
DN 10
ELEVATOR POSITION DEG.
0
UP 10
.4 .6 .8 1.0 1.2 1.4 1.6 1.8 2.0 2.2
CL

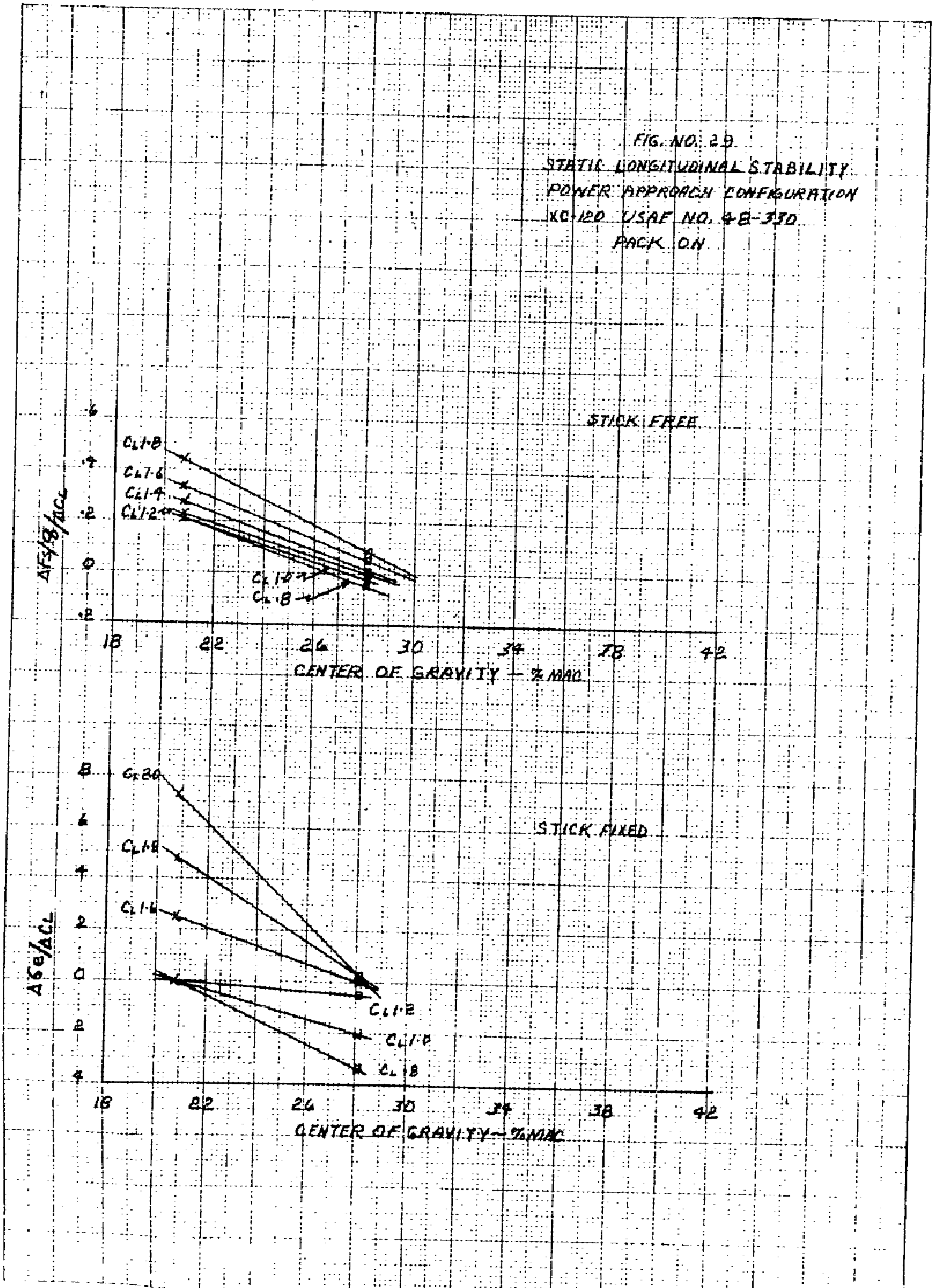


FIG. NO. 29
STATIC LONGITUDINAL STABILITY
POWER APPROACH CONFIGURATION
XC-120 USAF NO. 48-330
PACK ON
STICK FREE
ΔFs/B/ΔCL
CENTER OF GRAVITY — % MAC
STICK FIXED
Δδe/ΔCL
CENTER OF GRAVITY — % MAC

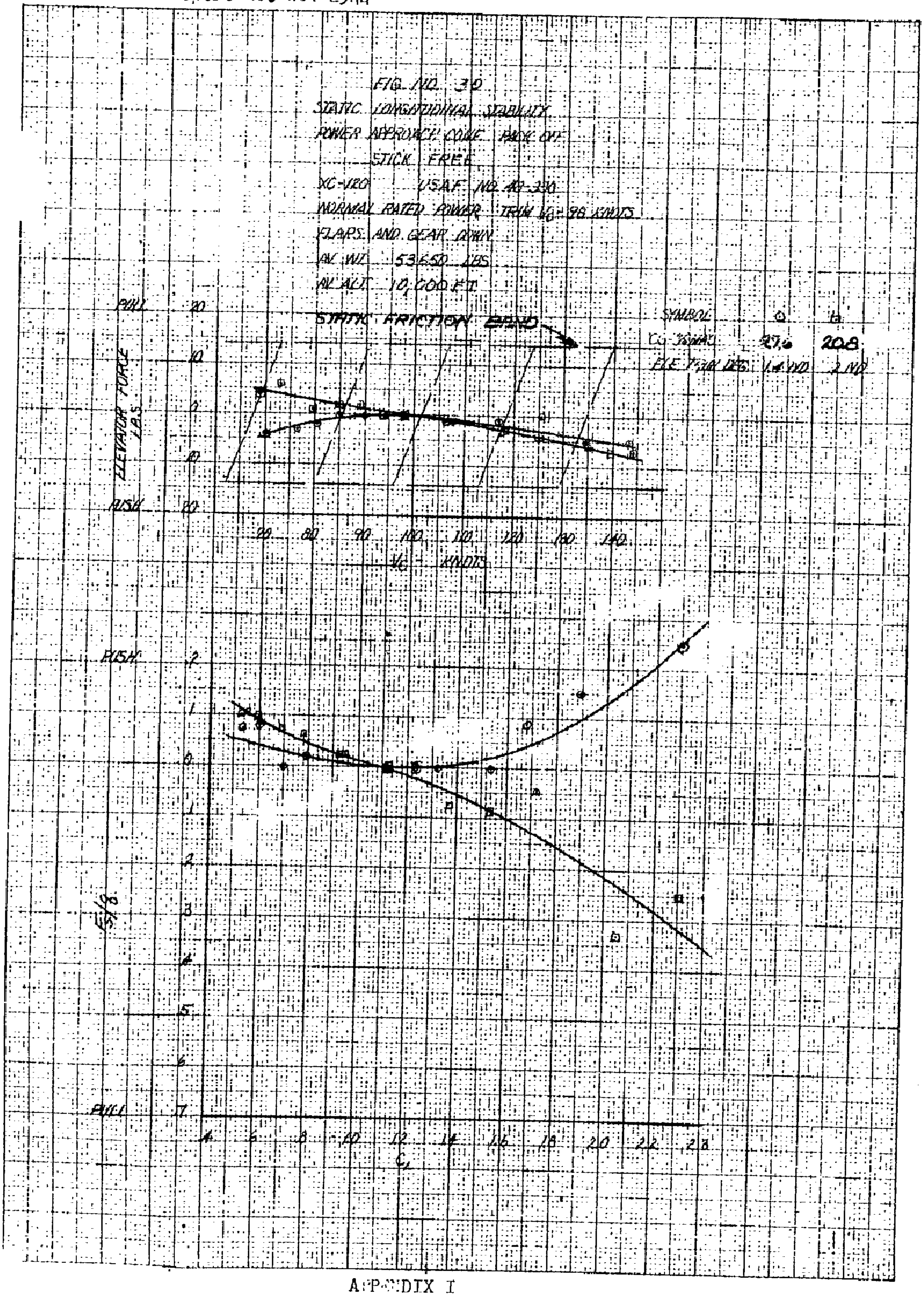


FIG. NO. 30
STATIC LONGITUDINAL STABILITY
POWER APPROACH CONF. BACK OFF
STICK FREE
XC-120 USAF NO. 48-330
NORMAL RATED POWER TRIM Vc = 98 KNOTS
FLAPS AND GEAR DOWN
AV. WT. 53,650 LBS
AV. ALT. 10,000 FT
STATIC FRICTION BAND
SYMBOL
20.8
PULL
PUSH
ELEVATOR FORCE LBS.
Vc - KNOTS
PUSH
PULL
C_L

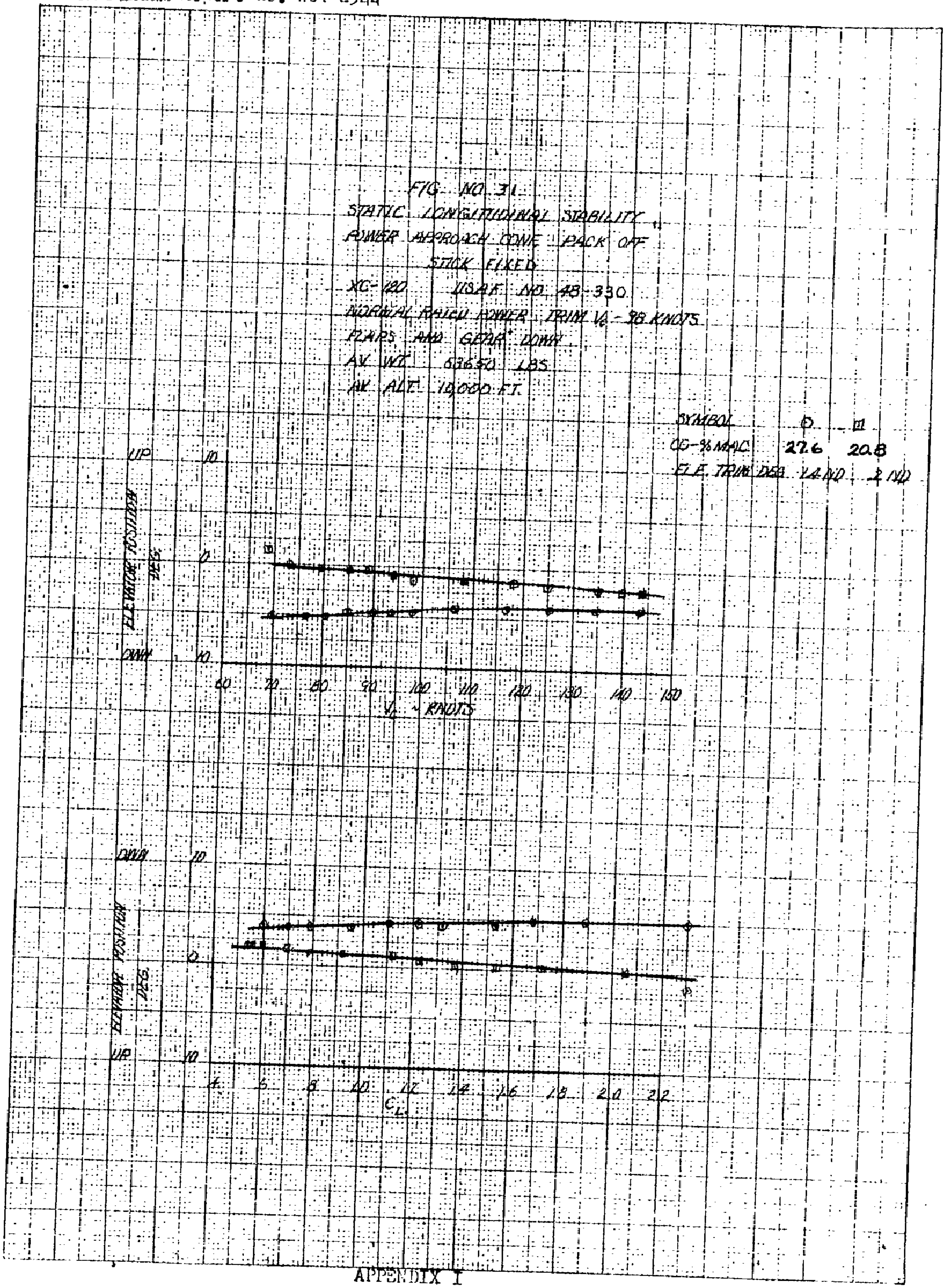


FIG. NO. 31
STATIC LONGITUDINAL STABILITY
POWER APPROACH CONF. PACK OFF
STICK FIXED
XC-120 USAF NO. 48-330
NORMAL RATED POWER TRIM V_c - 98 KNOTS
FLAPS AND GEAR DOWN
AV. WT. 63650 LBS
AV. ALT. 10,000 FT.
SYMBOL
CG-% MAC 27.6 20.8
ELE. TRIM DEG. 1.4 ND 2 ND
UP
10
0
DWN
10
ELEVATOR POSITION DEG.
60 70 80 90 100 110 120 130 140 150
V_c ~ KNOTS
DWN
10
0
UP
10
ELEVATOR POSITION DEG.
.4 .6 .8 1.0 1.2 1.4 1.6 1.8 2.0 2.2
C_L

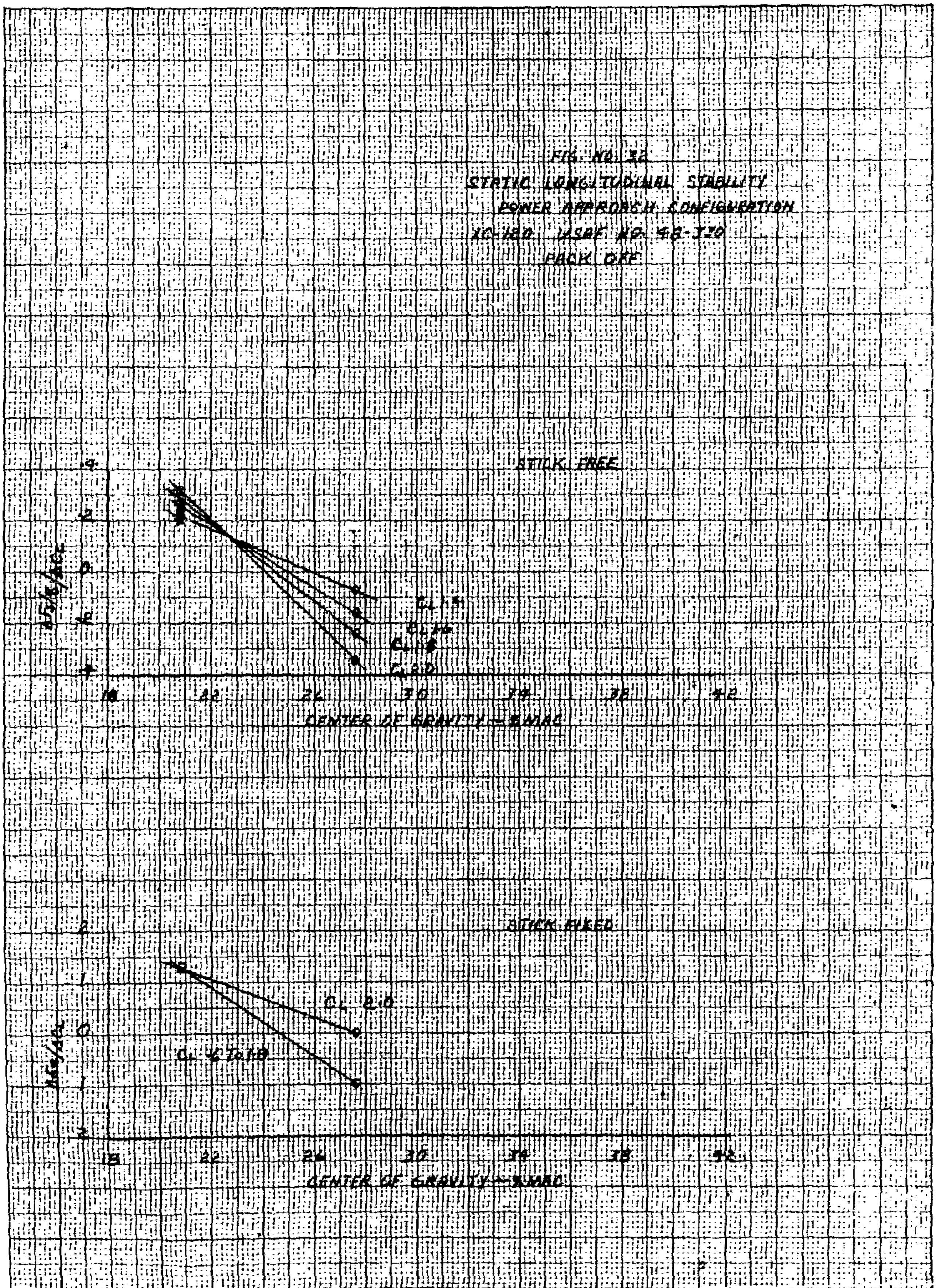
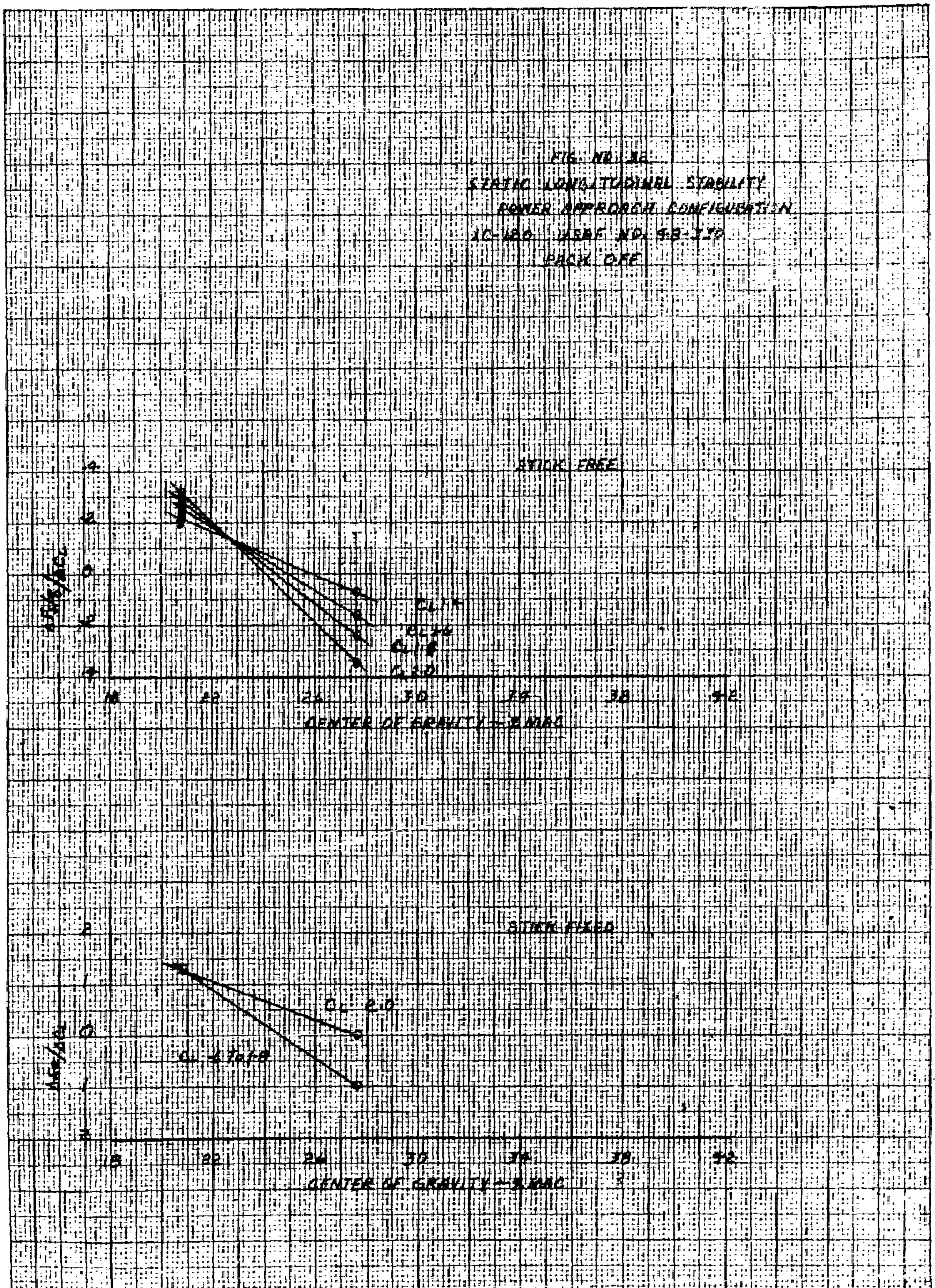


FIG. NO. 32
STATIC LONGITUDINAL STABILITY
POWER APPROACH CONFIGURATION
XC-120 USAF NO. 48-320
PACK OFF
STICK FREE
18
22
26
30
34
38
42
CENTER OF GRAVITY — % MAC
STICK FIXED
18
22
26
30
34
38
42
CENTER OF GRAVITY — % MAC


STATIC LONGITUDINAL STABILITY
POWER APPROACH CONFIGURATION
PACK OFF
STICK FREE
CENTER OF GRAVITY ~ % MAC
STICK FIXED
CENTER OF GRAVITY ~ % MAC

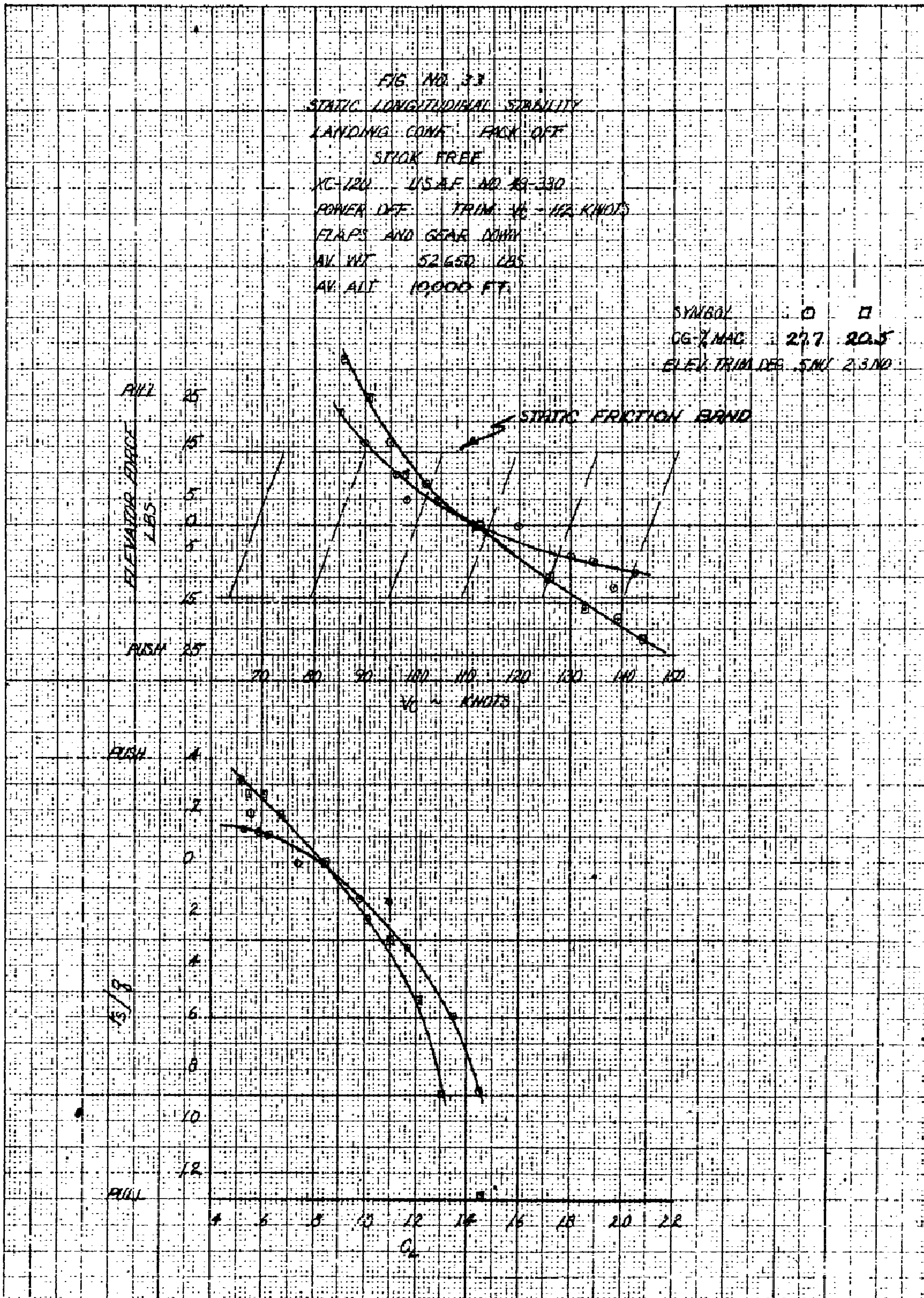


FIG. NO. 33
STATIC LONGITUDINAL STABILITY
LANDING CONF. PACK OFF
STICK FREE
XC-120 U.S.A.F. NO. 48-330
POWER OFF TRIM Vc - 112 KNOTS
FLAPS AND GEAR DOWN
AV. WT. 52,650 LBS.
AV. ALT. 10,000 FT.
SYMBOL ○ □
CG-% MAC 27.7 20.5
ELEV. TRIM DEG. .5 NU 2.3 ND
STATIC FRICTION BAND
ELEVATOR FORCE LBS.
PULL
PUSH
Vc ~ KNOTS
Fs/δ
CL

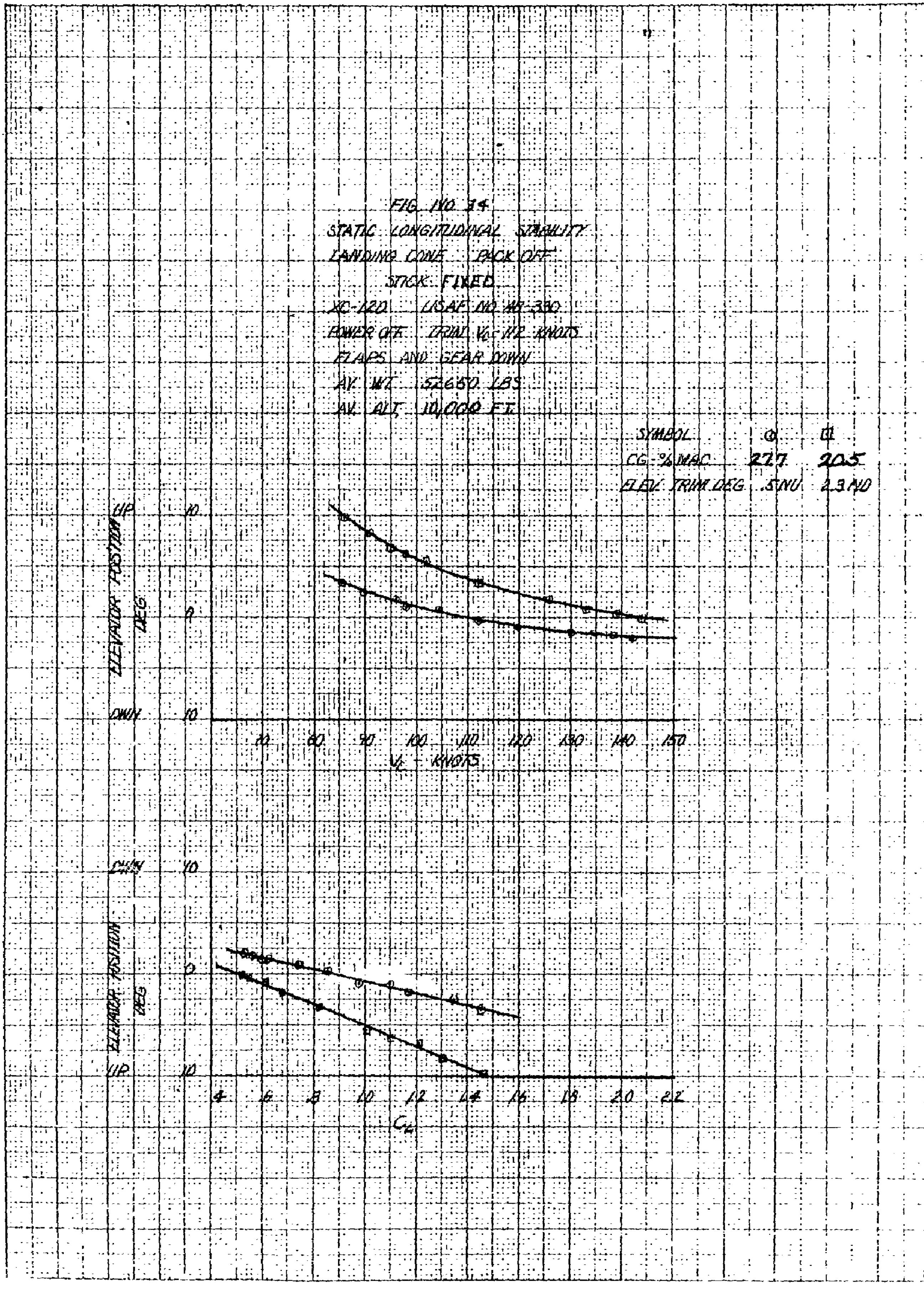


FIG. NO. 34
STATIC LONGITUDINAL STABILITY
LANDING CONE PACK OFF
STICK FIXED
XC-120 USAF NO 48-330
POWER OFF TRIM V_c=112 KNOTS
FLAPS AND GEAR DOWN
AV. WT. 52650 LBS
AV. ALT. 10,000 FT.
SYMBOL
CG-% MAC 27.7 20.5
ELEV. TRIM DEG .5 NU 2.3 ND
UP
DWN
ELEVATOR POSITION DEG
10
0
10
70 80 90 100 110 120 130 140 150
V_c - KNOTS
DWN
UP
10
0
10
.4 .6 .8 1.0 1.2 1.4 1.6 1.8 2.0 2.2
C_L

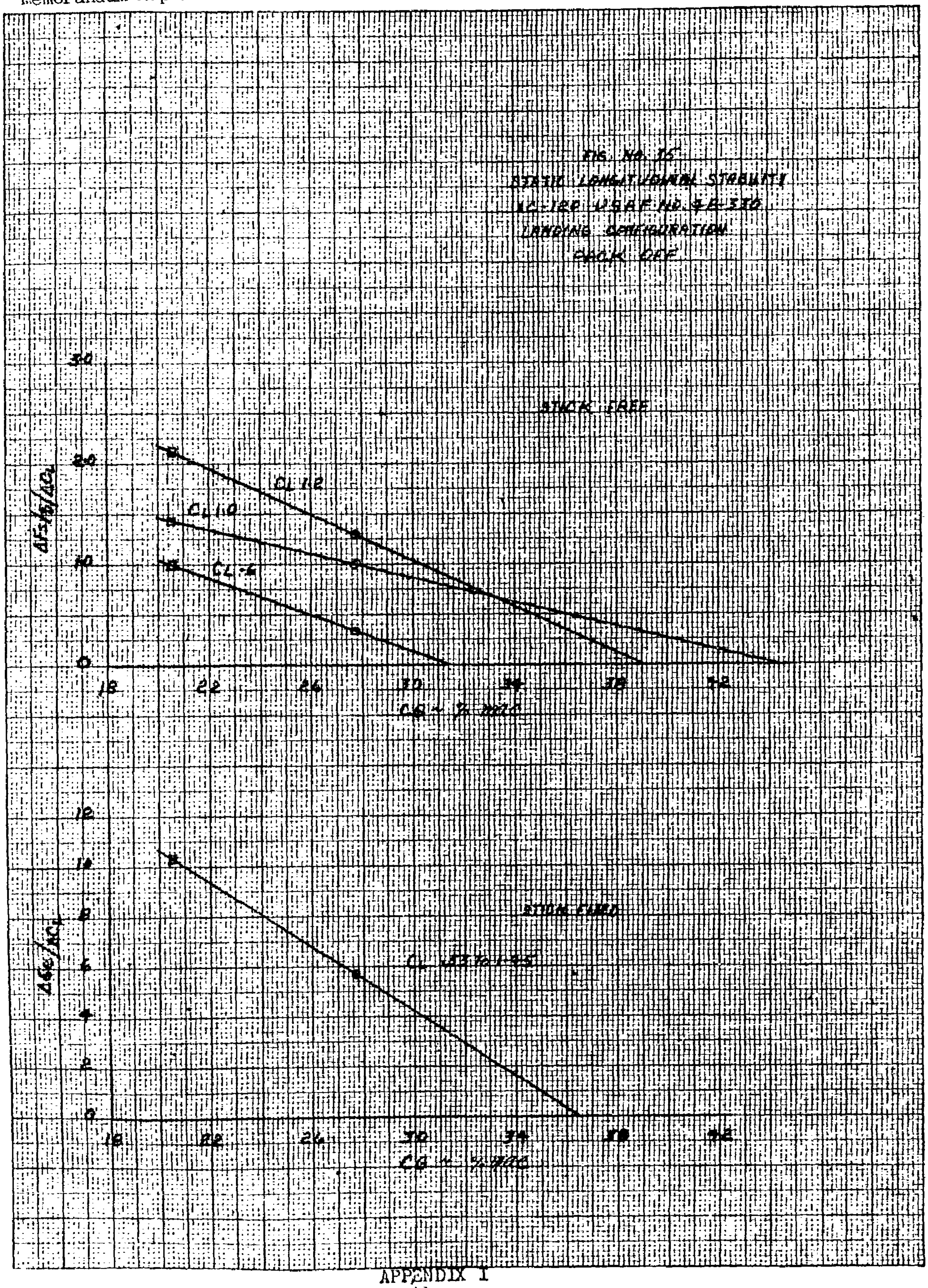


FIG. NO. 15
STATIC LONGITUDINAL STABILITY
XC-120 USAF NO. 48-330
LANDING CONFIGURATION
PACK OFF
STICK FREE
CL 1.2
CL 1.0
CL .6
CG ~ % MAC
STICK FIXED
CL .53 TO 1.25
CG ~ % MAC

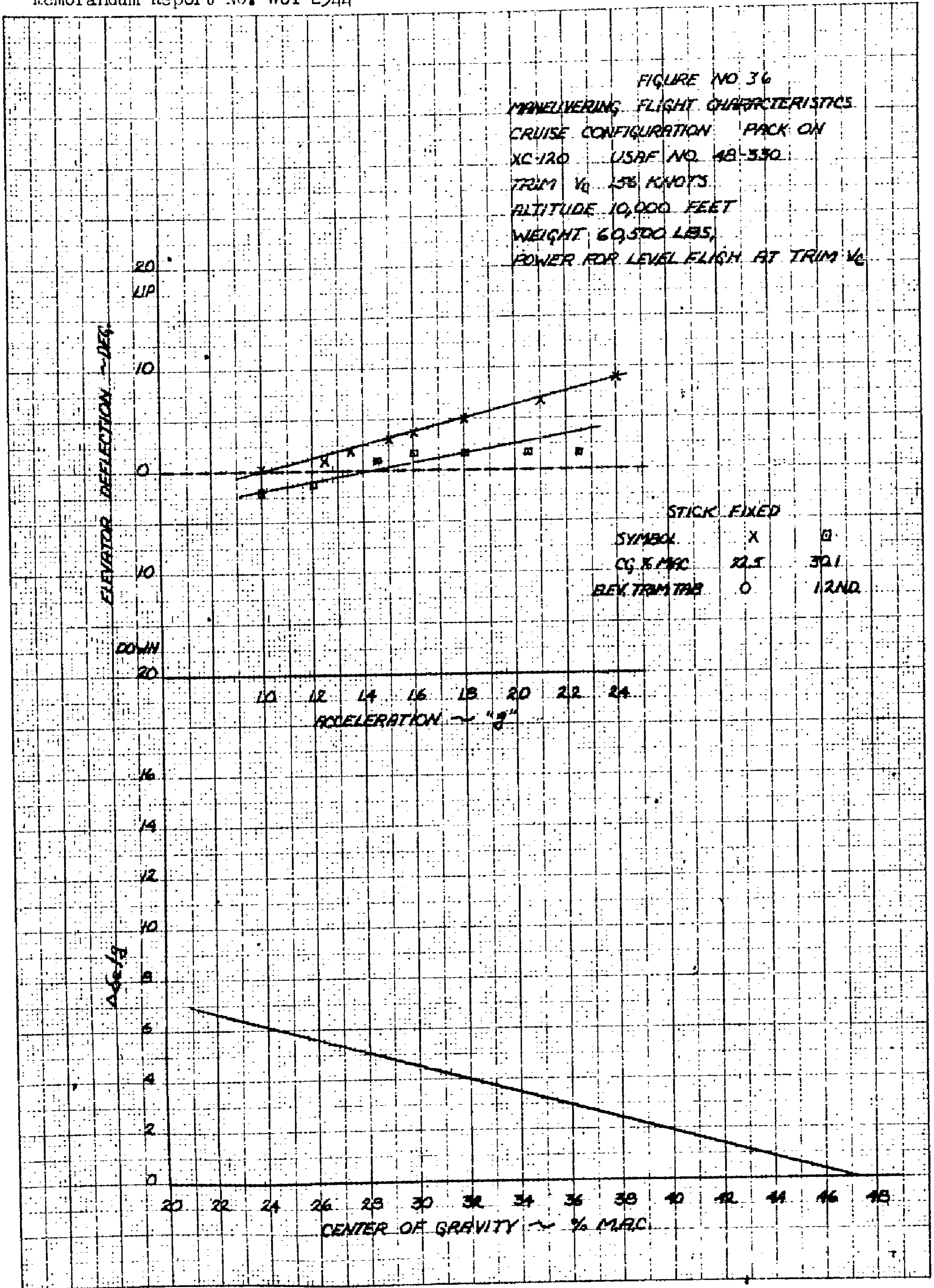


FIGURE NO 36
MANEUVERING FLIGHT CHARACTERISTICS
CRUISE CONFIGURATION PACK ON
XC-120 USAF NO 48-330
TRIM V_c 156 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 60,500 LBS,
POWER FOR LEVEL FLIGH AT TRIM V_c
STICK FIXED
SYMBOL X ⊡
CG % MAC 22.5 30.1
ELEV. TRIM TAB 0 1.2ND
ELEVATOR DEFLECTION ~ DEG.
20 UP
10
0
10
DOWN 20
1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4
ACCELERATION ~ "g"
16
14
12
10
8
6
4
2
0
Δδe/g
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
CENTER OF GRAVITY ~ % M.A.C.

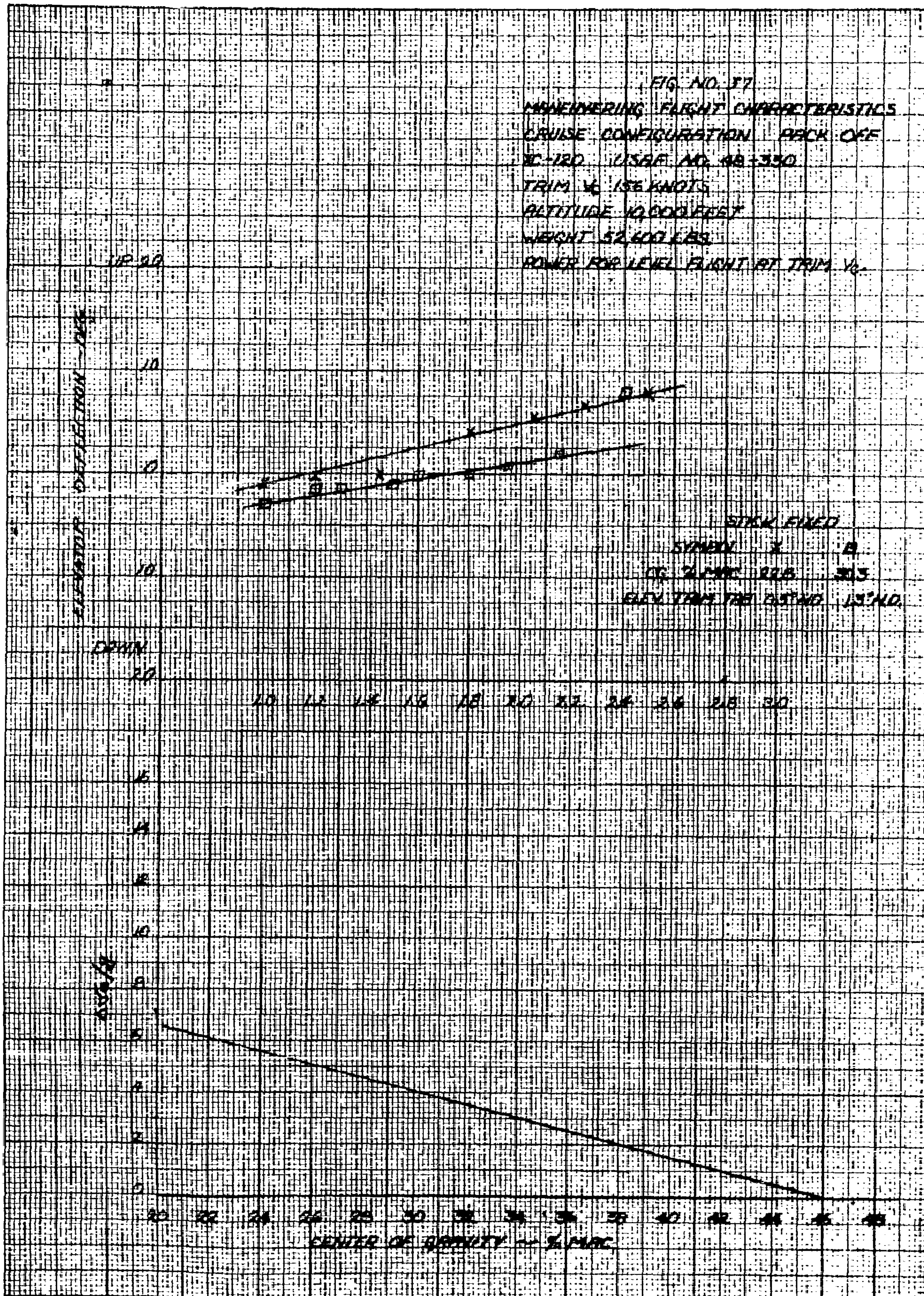


FIG. NO. 37
MANEUVERING FLIGHT CHARACTERISTICS
CRUISE CONFIGURATION BACK OFF
C-120 USAF NO. 48-330
TRIM V_c 156 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,600 LBS
POWER FOR LEVEL FLIGHT AT TRIM V_c
UP 20
10
0
10
DOWN 20
ELEVATOR DEFLECTION — DEG.
STICK FIXED
SYMBOL X ⊡
C.G. % MAC 22.8 30.3
ELEV. TRIM TAB 0.5° ND 1.3° N.D.
1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0
16
14
12
10
8
6
4
2
0
Δδe/Δn
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
CENTER OF GRAVITY — % MAC

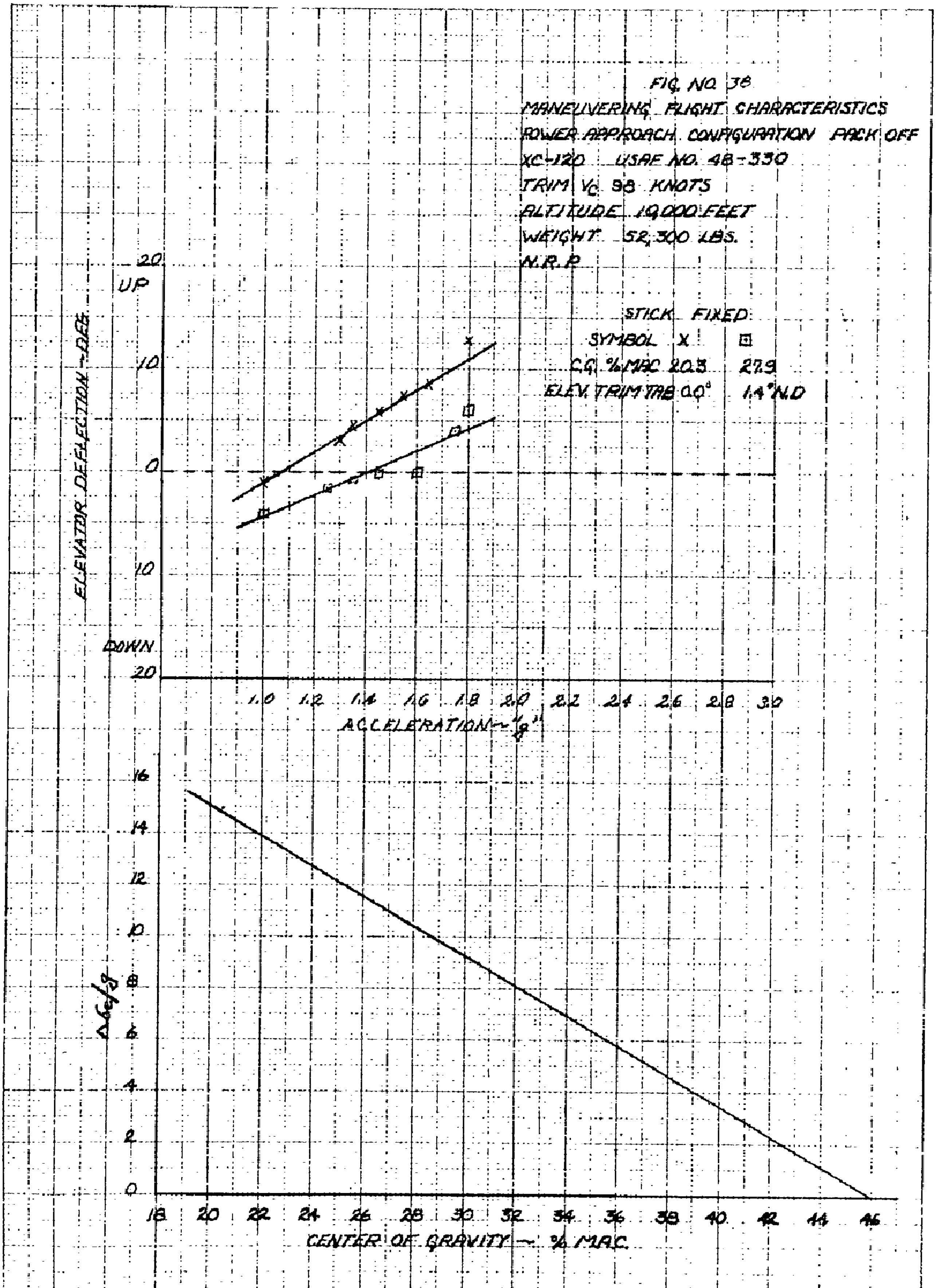


FIG. NO. 38
MANEUVERING FLIGHT CHARACTERISTICS
POWER APPROACH CONFIGURATION PACK OFF
XC-120 USAF NO. 48-330
TRIM V_C 98 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,300 LBS.
N.R.P.
STICK FIXED
SYMBOL X ⊡
C.G. % MAC 20.5 27.9
ELEV. TRIM TAB 0.0° 1.4° N.D
ELEVATOR DEFLECTION ~ DEG
UP
DOWN
20
10
0
10
20
1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0
ACCELERATION ~ "g"
16
14
12
10
8
6
4
2
0
18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
CENTER OF GRAVITY ~ % MAC

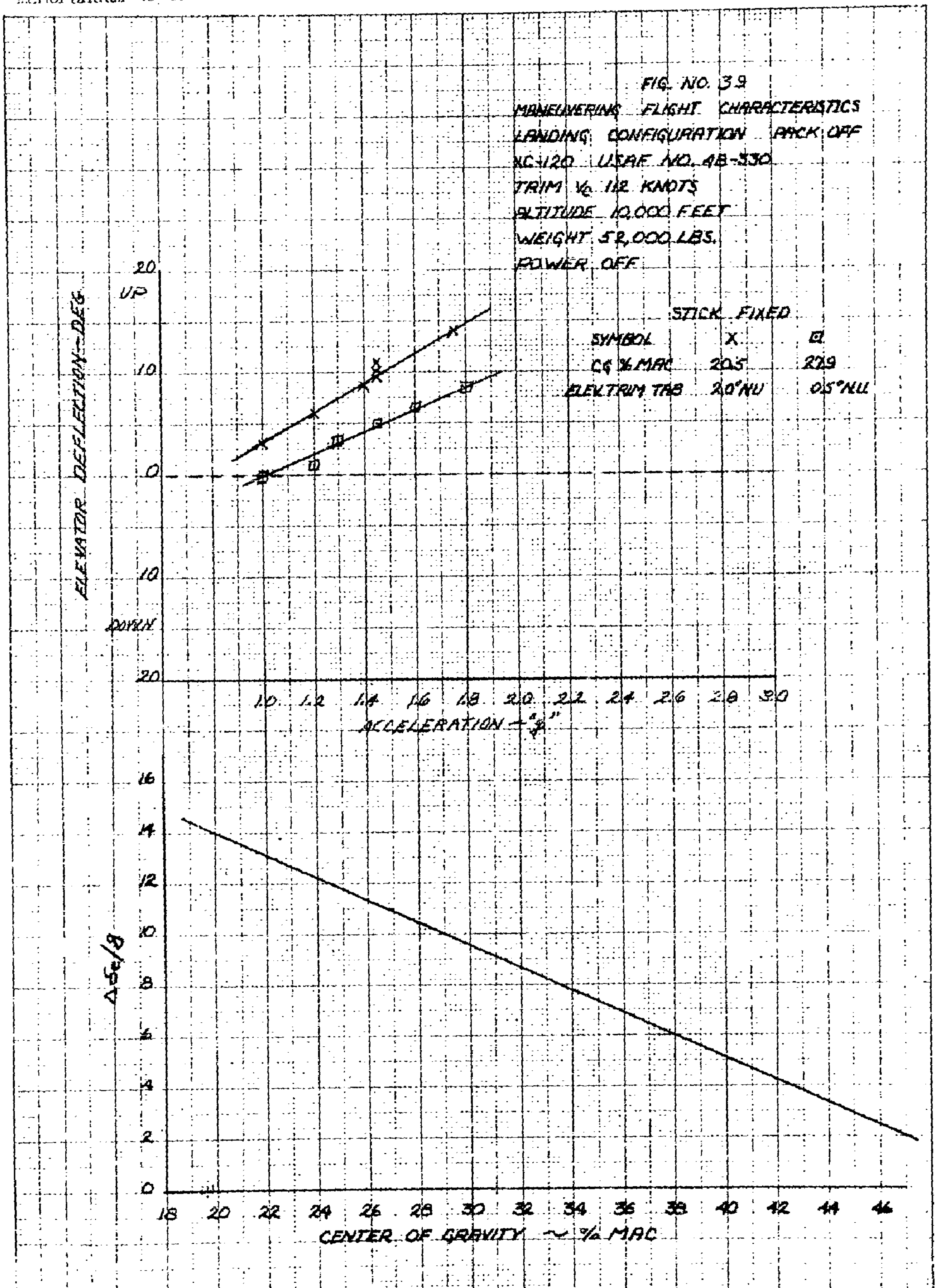


FIG. NO. 39
MANEUVERING FLIGHT CHARACTERISTICS
LANDING CONFIGURATION PACK OFF
YC-120 USAF NO. 48-330
TRIM V_c 112 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,000 LBS.
POWER OFF
STICK FIXED
SYMBOL X ⊡
CG % MAC 20.5 22.9
ELEV. TRIM TAB 2.0° NU 0.5° NU
ELEVATOR DEFLECTION — DEG
20 UP 10 0 10 DOWN 20
1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0
ACCELERATION — "g"
$\Delta\delta_e/g$
16 14 12 10 8 6 4 2 0
18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
CENTER OF GRAVITY ~ % MAC

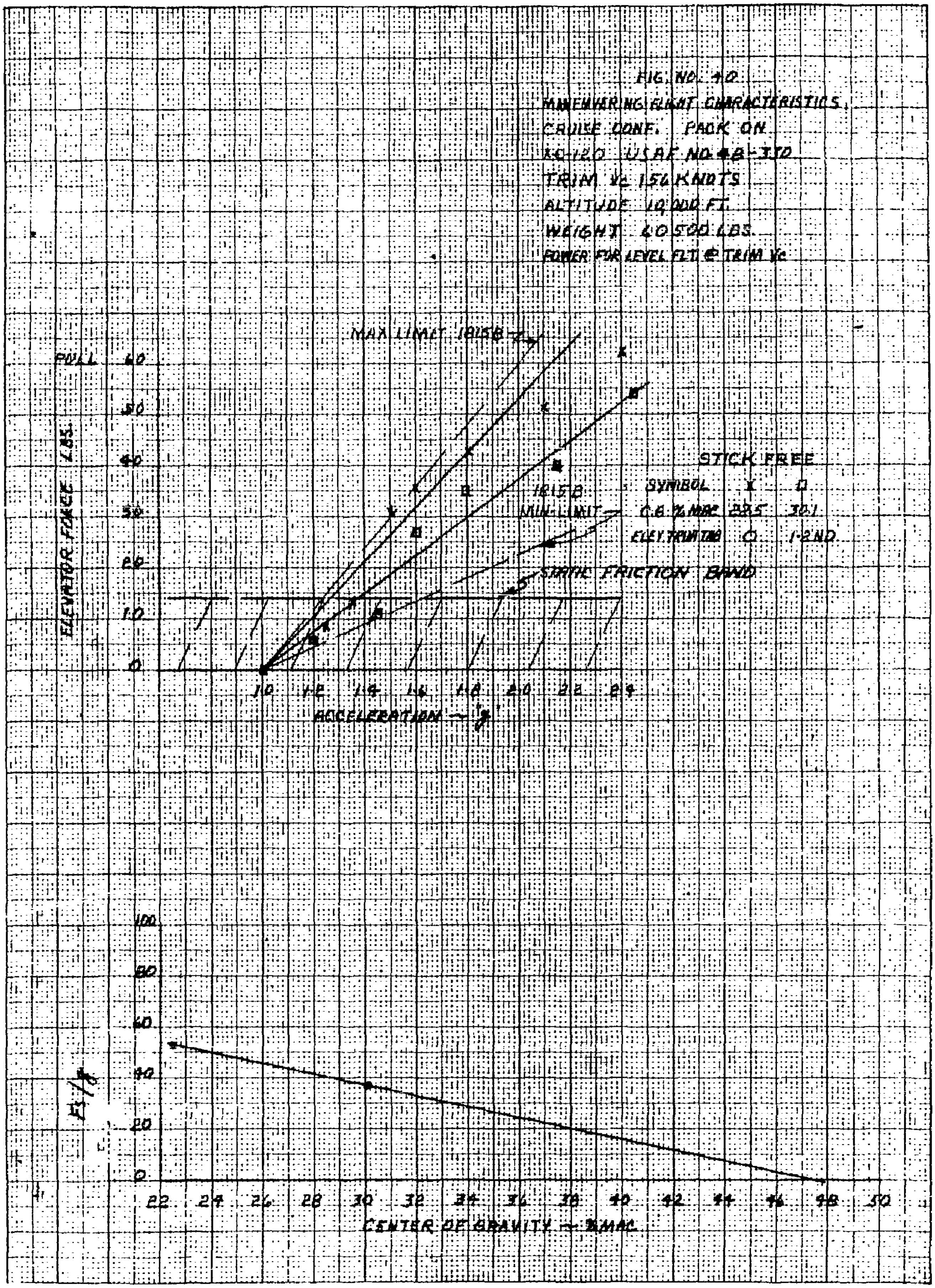


FIG. NO. 40
MANEUVERING FLIGHT CHARACTERISTICS
CRUISE CONF. PACK ON
XC-120 USAF NO 48-330
TRIM Vc 156 KNOTS
ALTITUDE 10,000 FT.
WEIGHT 40,500 LBS.
POWER FOR LEVEL FLT @ TRIM Vc
MAX LIMIT 1815B
PULL
ELEVATOR FORCE LBS.
STICK FREE
SYMBOL
C.G. % MAC 23.5 30.1
ELEV. TRIM TAB 0 1.2ND
1815B MIN LIMIT
STATIC FRICTION BAND
ACCELERATION ~ g
CENTER OF GRAVITY ~ % MAC

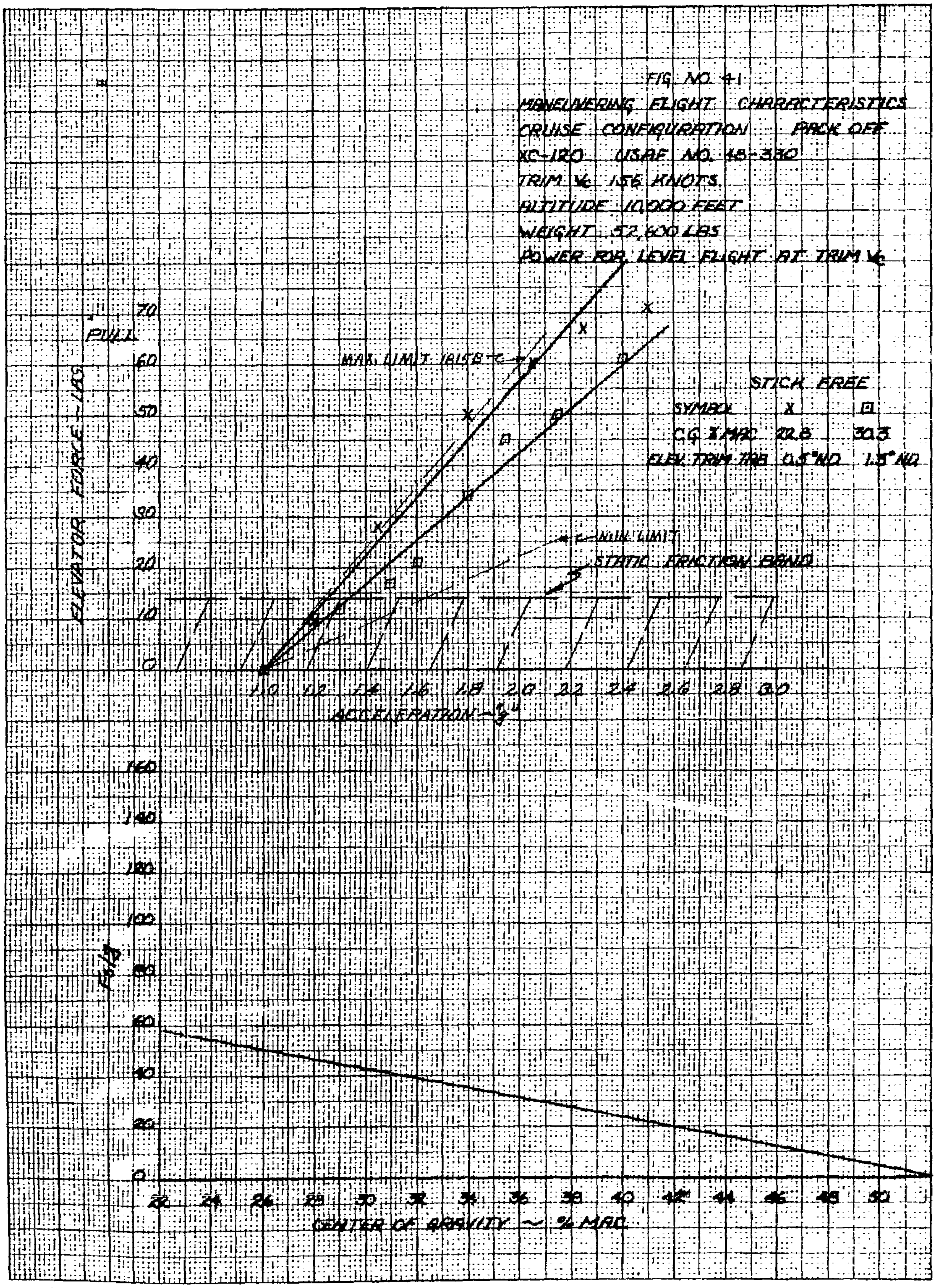


FIG. NO. 41
MANEUVERING FLIGHT CHARACTERISTICS
CRUISE CONFIGURATION PACK OFF
XC-120 USAF NO. 48-330
TRIM V_c 156 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,600 LBS
POWER FOR LEVEL FLIGHT AT TRIM V_c
STICK FREE
SYMBOL X ⊡
C.G. % MAC 22.8 30.3
ELEV. TRIM TAB 0.5° ND 1.5° ND
MAX. LIMIT
MIN. LIMIT
STATIC FRICTION BAND
PULL
ELEVATOR FORCE ~ LBS
ACCELERATION ~ "g"
Fs/g
CENTER OF GRAVITY ~ % MAC

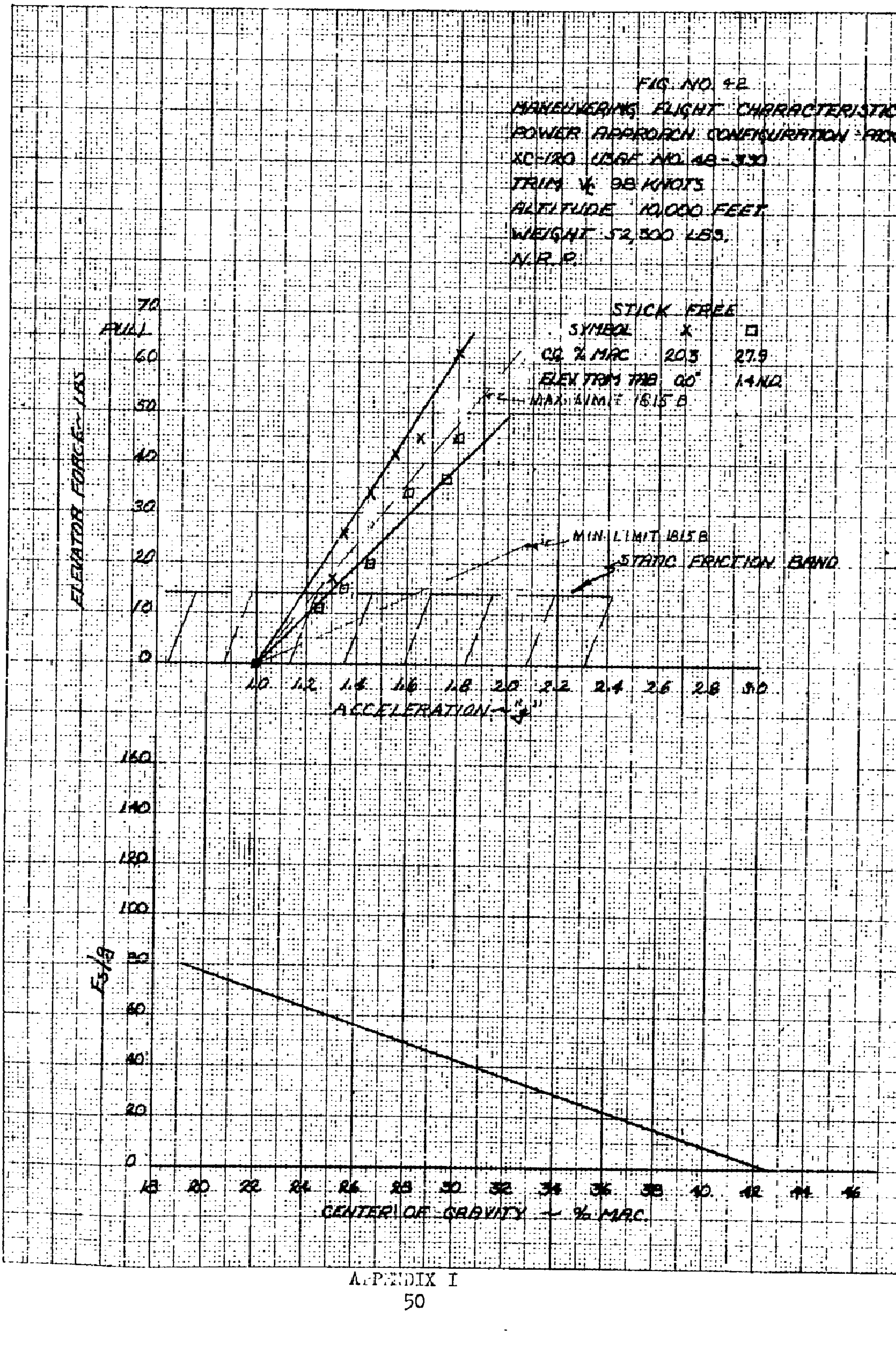


FIG. NO. 42
MANEUVERING FLIGHT CHARACTERISTICS
POWER APPROACH CONFIGURATION - PICKOFF
XC-120 USAF NO. 48-330
TRIM V_c 98 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,300 LBS.
N.R.P.
STICK FREE
SYMBOL X □
C.G. % MAC 20.3 27.9
ELEV TRIM TAB 0.0° 1.4 N.O.
MAX LIMIT 1815 B
MIN LIMIT 1815 B
STATIC FRICTION BAND
PULL
ELEVATOR FORCE ~ LBS
70
60
50
40
30
20
10
0
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
ACCELERATION ~ "g"
Fs/g
160
140
120
100
80
60
40
20
0
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
CENTER OF GRAVITY ~ % MAC.

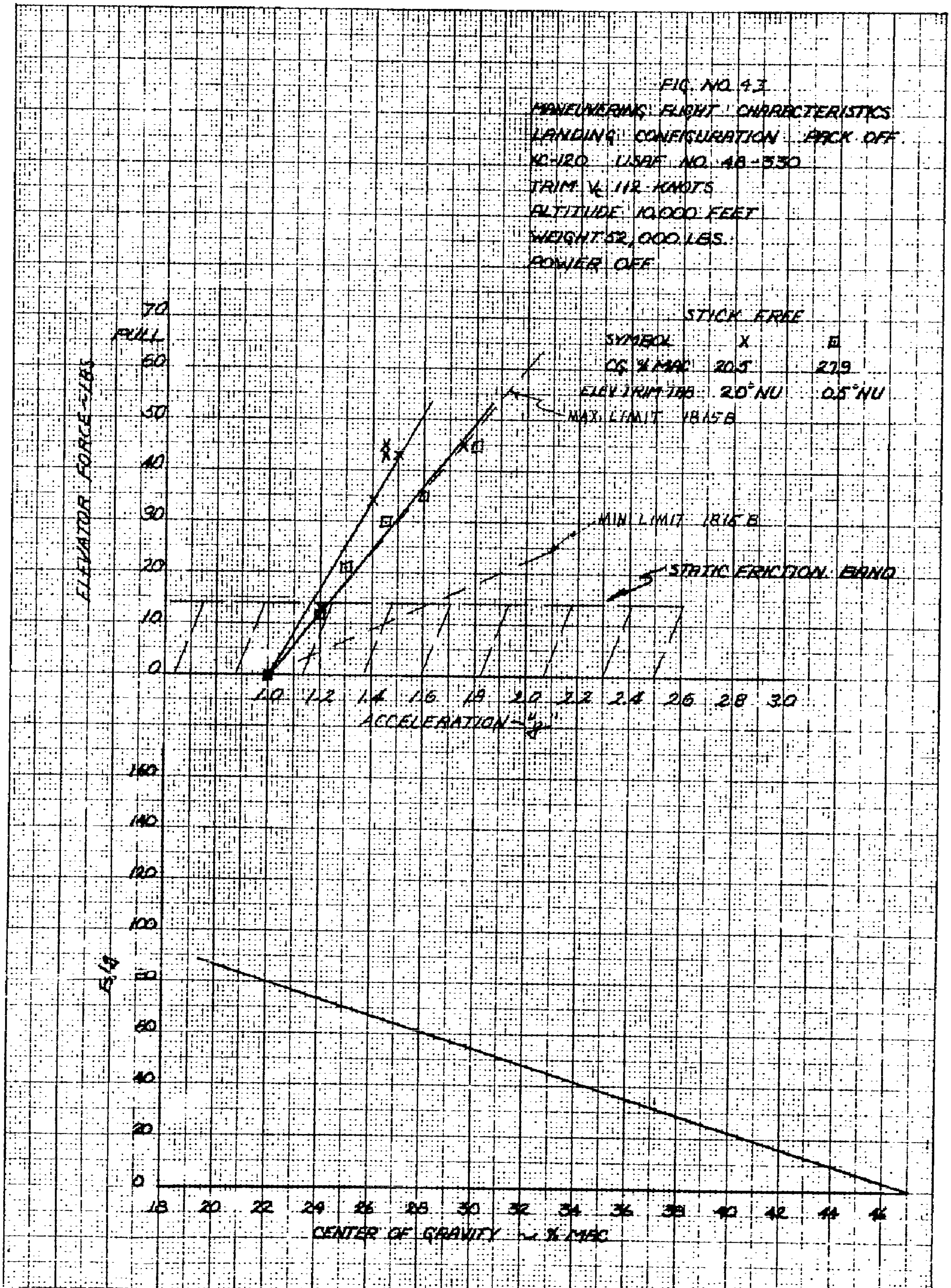


FIG. NO. 43
MANEUVERING FLIGHT CHARACTERISTICS
LANDING CONFIGURATION PACK OFF
XC-120 USAF NO. 48-330
TRIM V_c 112 KNOTS
ALTITUDE 10,000 FEET
WEIGHT 52,000 LBS.
POWER OFF
STICK FREE
SYMBOL X ⊡
CG % MAC 20.5 27.9
ELEV TRIM TAB 2.0° NU 0.5° NU
MAX LIMIT 18.15 B
MIN LIMIT 18.15 B
STATIC FRICTION BAND
ELEVATOR FORCE ~ LBS
PULL
ACCELERATION ~ g
CENTER OF GRAVITY ~ % MAC

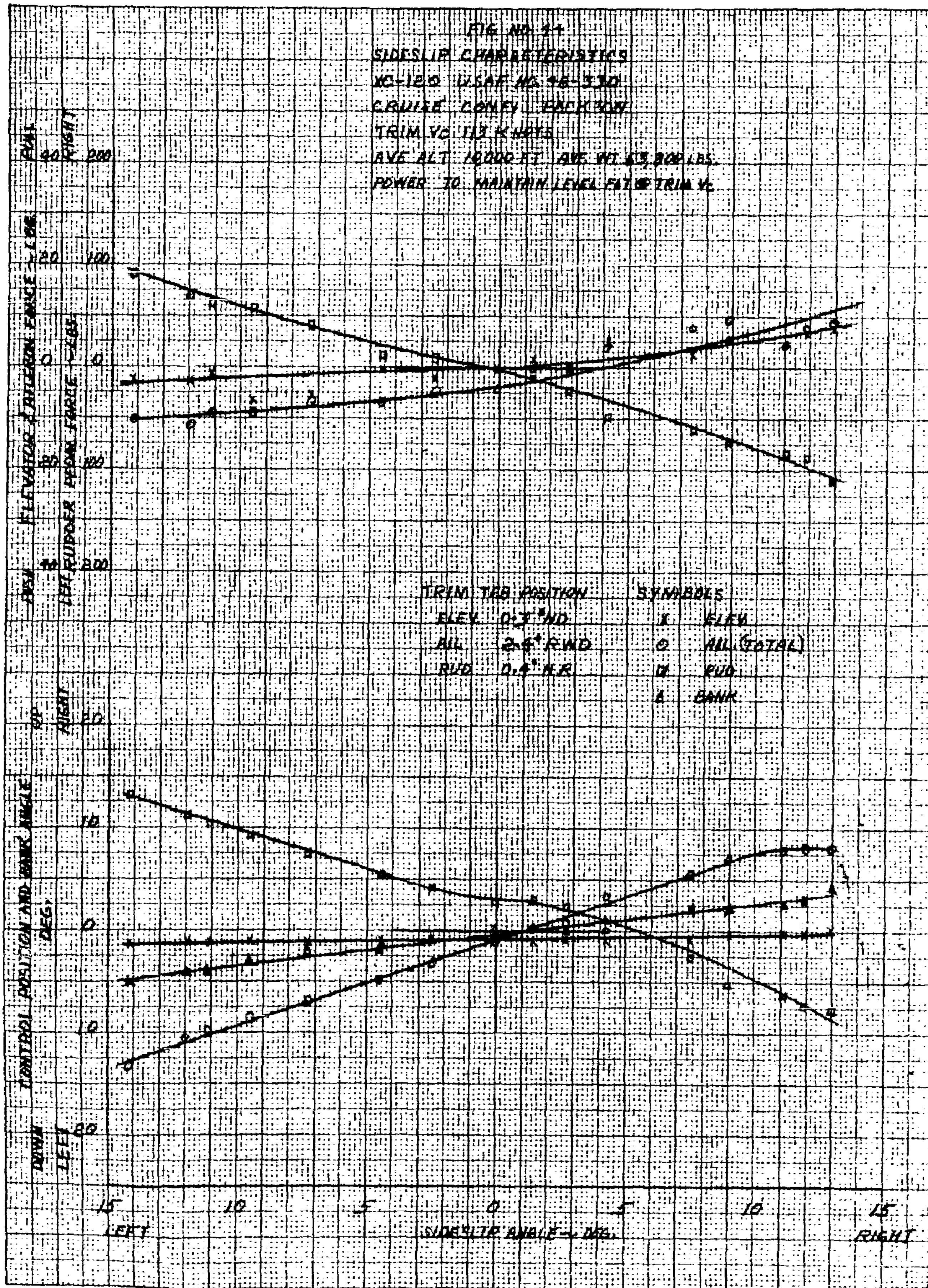


FIG NO 44
SIDESLIP CHARACTERISTICS
XC-120 USAF NO 48-330
CRUISE CONFIG PACKPLANE
TRIM VC 113 KNOTS
AVE ALT 10000 FT AVE WT 53,800 LBS.
POWER TO MAINTAIN LEVEL FLT @ TRIM VC
TRIM TAB POSITION
ELEV 0.3° ND
AIL 2.4° RWD
RUD 0.4° R
SYMBOLS
ELEV
AIL (TOTAL)
RUD
BANK
ELEVATOR & AILERON FORCE ~ LBS
RUDDER PEDAL FORCE ~ LBS
CONTROL POSITION AND BANK ANGLE DEG
PULL
PUSH
UP
DOWN
RIGHT
LEFT
40
20
0
20
40
200
100
0
100
200
20
10
0
10
20
15
10
5
0
5
10
15
SIDESLIP ANGLE ~ DEG.

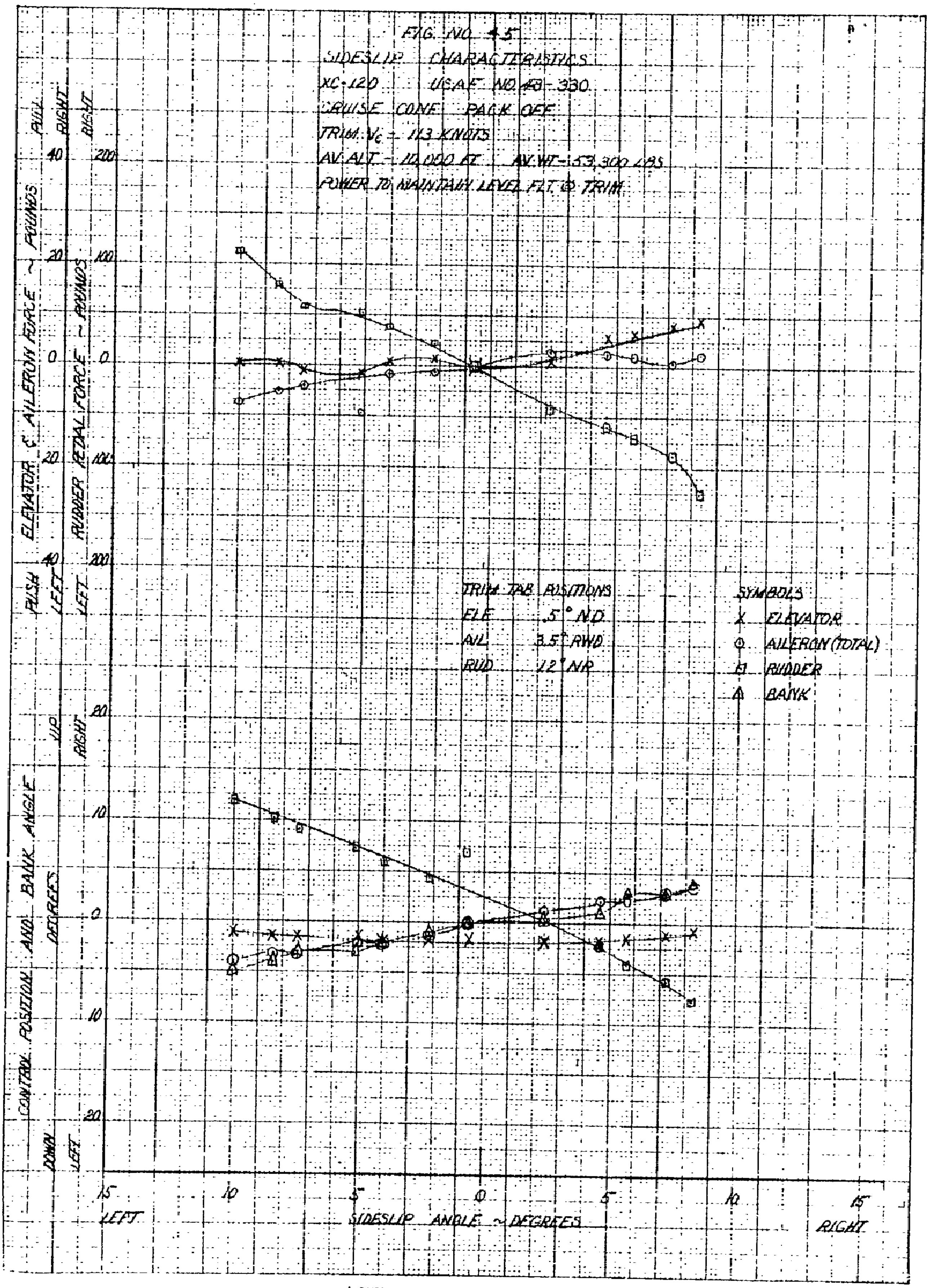
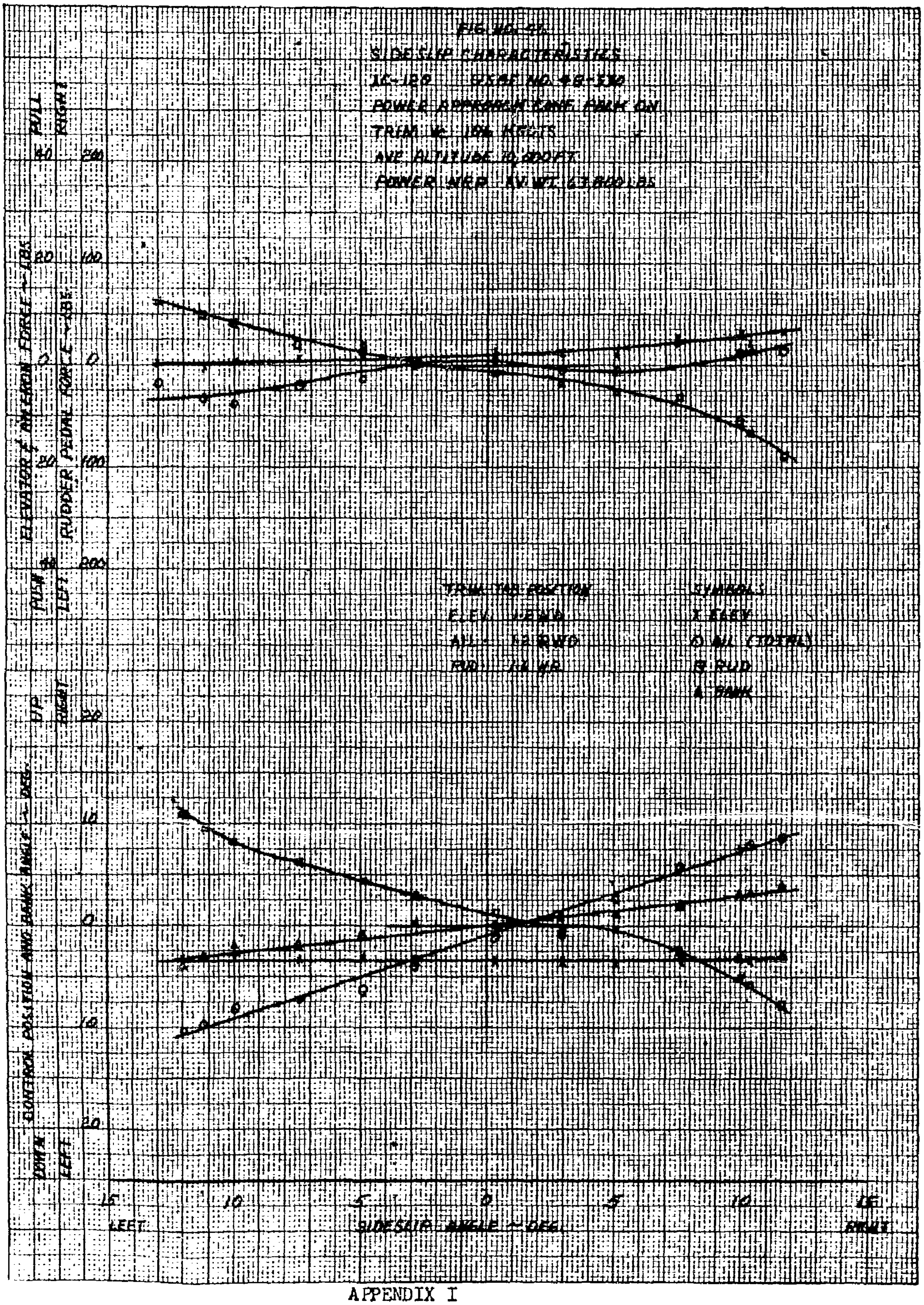


FIG. NO. 45
SIDESLIP CHARACTERISTICS
XC-120 USAF NO. 48-330
CRUISE CONF. PACK OFF
TRIM: Vc = 173 KNOTS
AV. ALT. = 10,000 FT AV. WT. = 53,300 LBS
POWER TO MAINTAIN LEVEL FLT @ TRIM
PULL RIGHT RIGHT
PUSH LEFT LEFT
ELEVATOR & AILERON FORCE ~ POUNDS
RUDDER PEDAL FORCE ~ POUNDS
TRIM TAB POSITIONS
ELE .5° ND
AIL 3.5° RWD
RUD 1.2° NR
SYMBOLS
X ELEVATOR
Φ AILERON (TOTAL)
⊡ RUDDER
Δ BANK
UP RIGHT
DOWN LEFT
CONTROL POSITION AND BANK ANGLE DEGREES
LEFT
SIDESLIP ANGLE ~ DEGREES
RIGHT


SIDESLIP CHARACTERISTICS
TRIM TAB POSITION
SYMBOLS
X ELEV
O AIL (TOTAL)
RUD
BANK
ELEVATOR & AILERON FORCE ~ LBS
RUDDER PEDAL FORCE ~ LBS
CONTROL POSITION AND BANK ANGLE ~ DEG
PULL
PUSH
UP
DOWN
RIGHT
LEFT
SIDESLIP ANGLE ~ DEG
LEFT
RIGHT

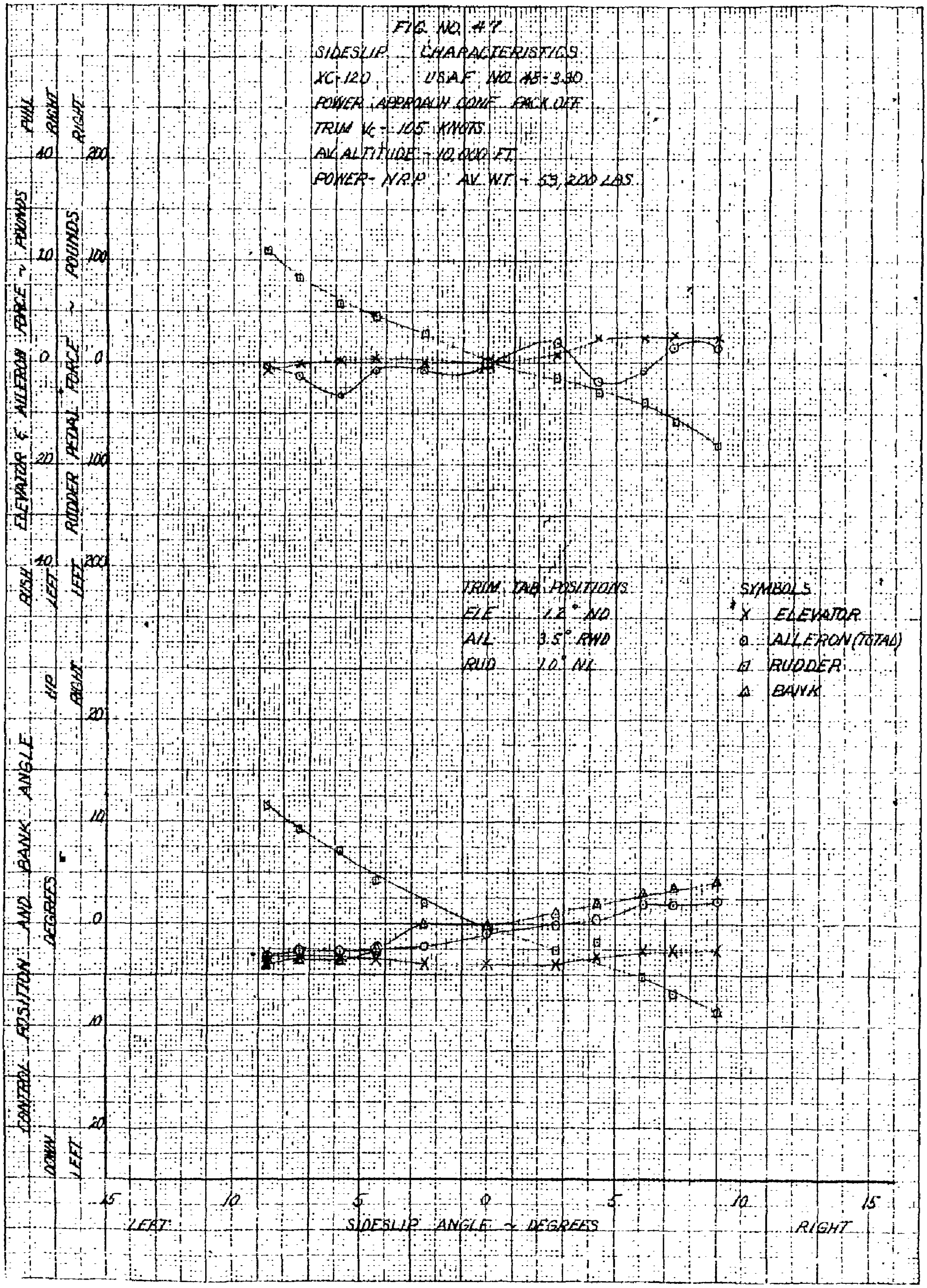
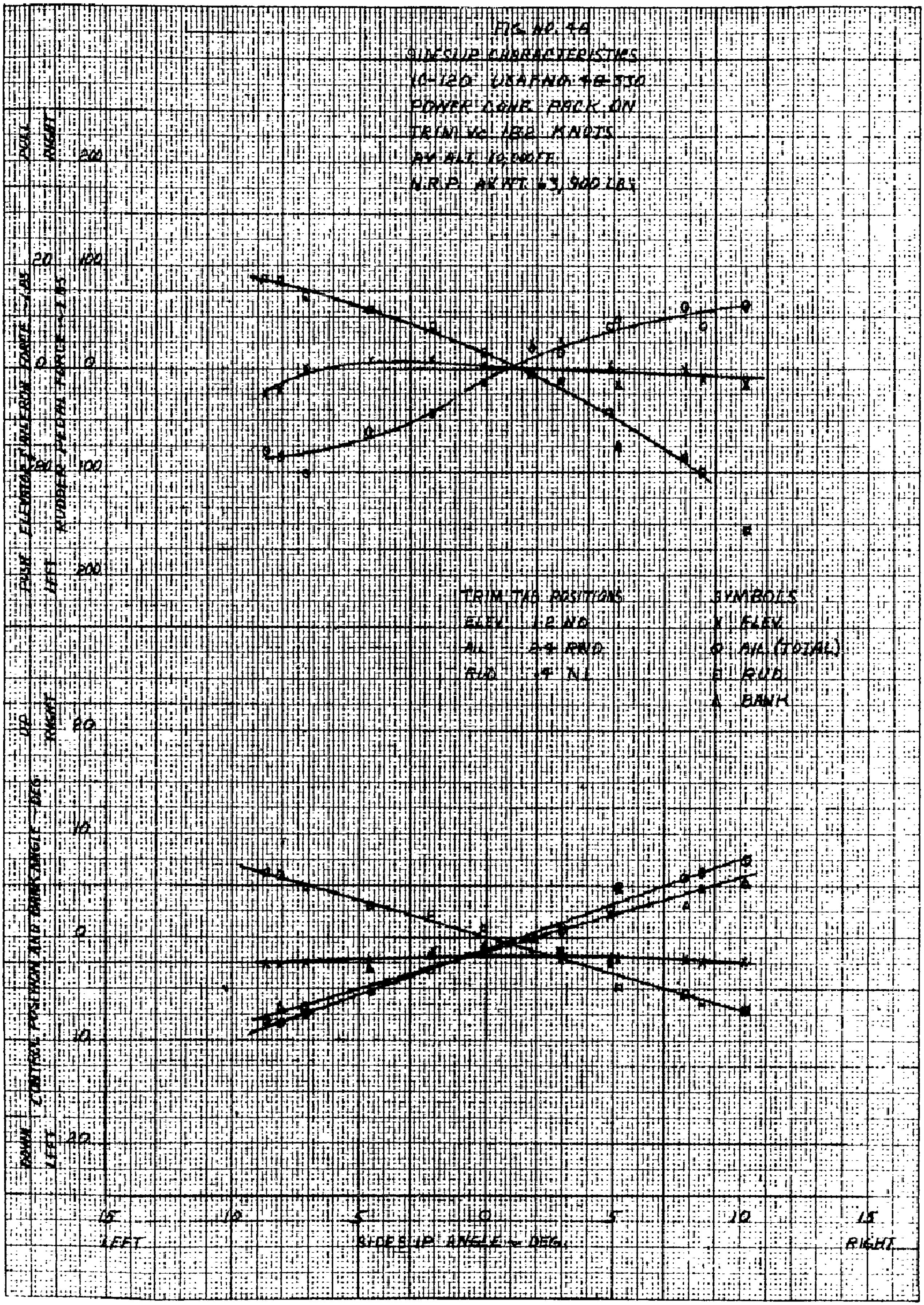
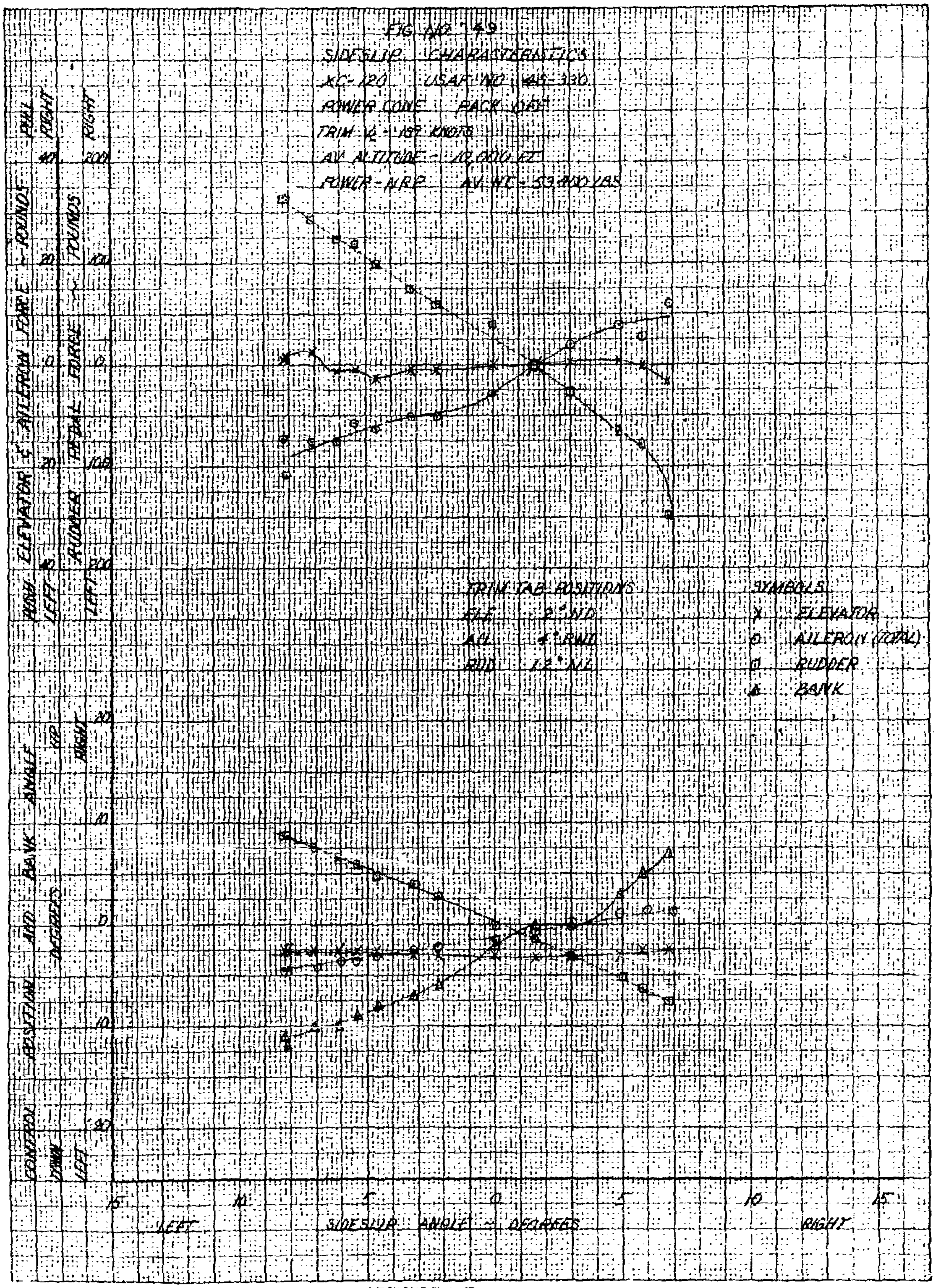


FIG. NO. #7
SIDESLIP CHARACTERISTICS
XC-120 USAF NO. 45-330
POWER APPROACH CONF. PACK OFF
TRIM Vc = 105 KNOTS
AV. ALTITUDE = 10,000 FT.
POWER - N.R.P. AV. WT. = 53,200 LBS.
PULL RIGHT RIGHT
ELEVATOR & AILERON FORCE ~ POUNDS
RUDDER PEDAL FORCE ~ POUNDS
PUSH LEFT LEFT
TRIM TAB POSITIONS
ELE 1.2° ND
AIL 3.5° RWD
RUD 1.0° NL
SYMBOLS
X ELEVATOR
o AILERON (TOTAL)
RUDDER
BANK
UP RIGHT
CONTROL POSITION AND BANK ANGLE
DEGREES
DOWN LEFT
LEFT
SIDESLIP ANGLE ~ DEGREES
RIGHT


SIDESLIP CHARACTERISTICS
TRIM TAB POSITIONS
SYMBOLS
ELEV.
A/L (TOTAL)
RUD.
BANK
SIDESLIP ANGLE ~ DEG.
LEFT
RIGHT



359T-14C KEUFFEL & ESSER CO.
Millimeters, 5 mm. lines accented, cm. lines heavy.
MADE IN U.S.A.

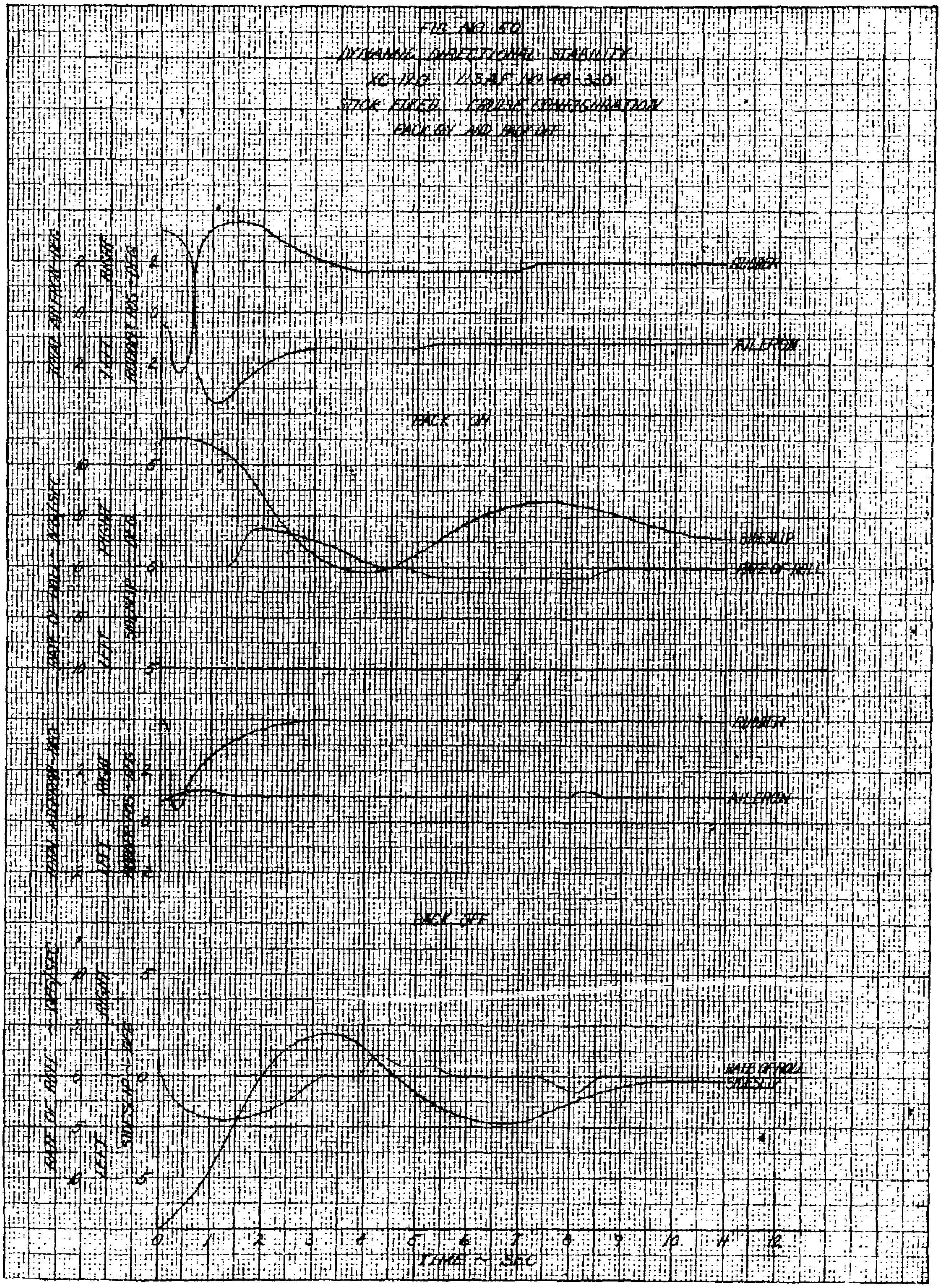


FIG. NO. 50
DYNAMIC DIRECTIONAL STABILITY
XC-120 USAF NO 48-330
STICK FIXED CRUISE CONFIGURATION
PACK ON AND PACK OFF
RUDDER
AILERON
PACK ON
SIDESLIP
RATE OF ROLL
PACK OFF
RIGHT
LEFT
0
1
2
3
4
5
6
7
8
9
10
11
12
TIME ~ SEC

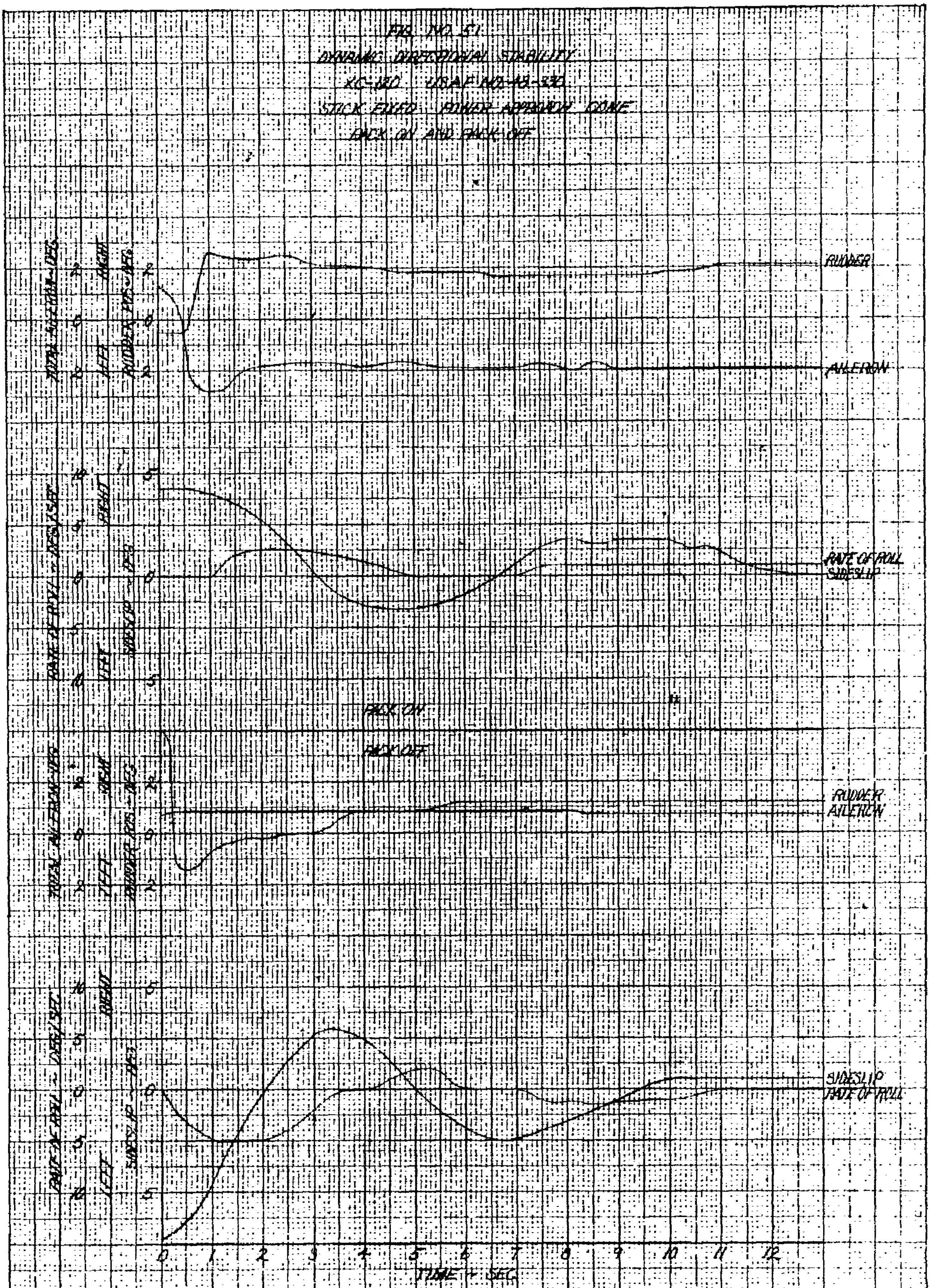
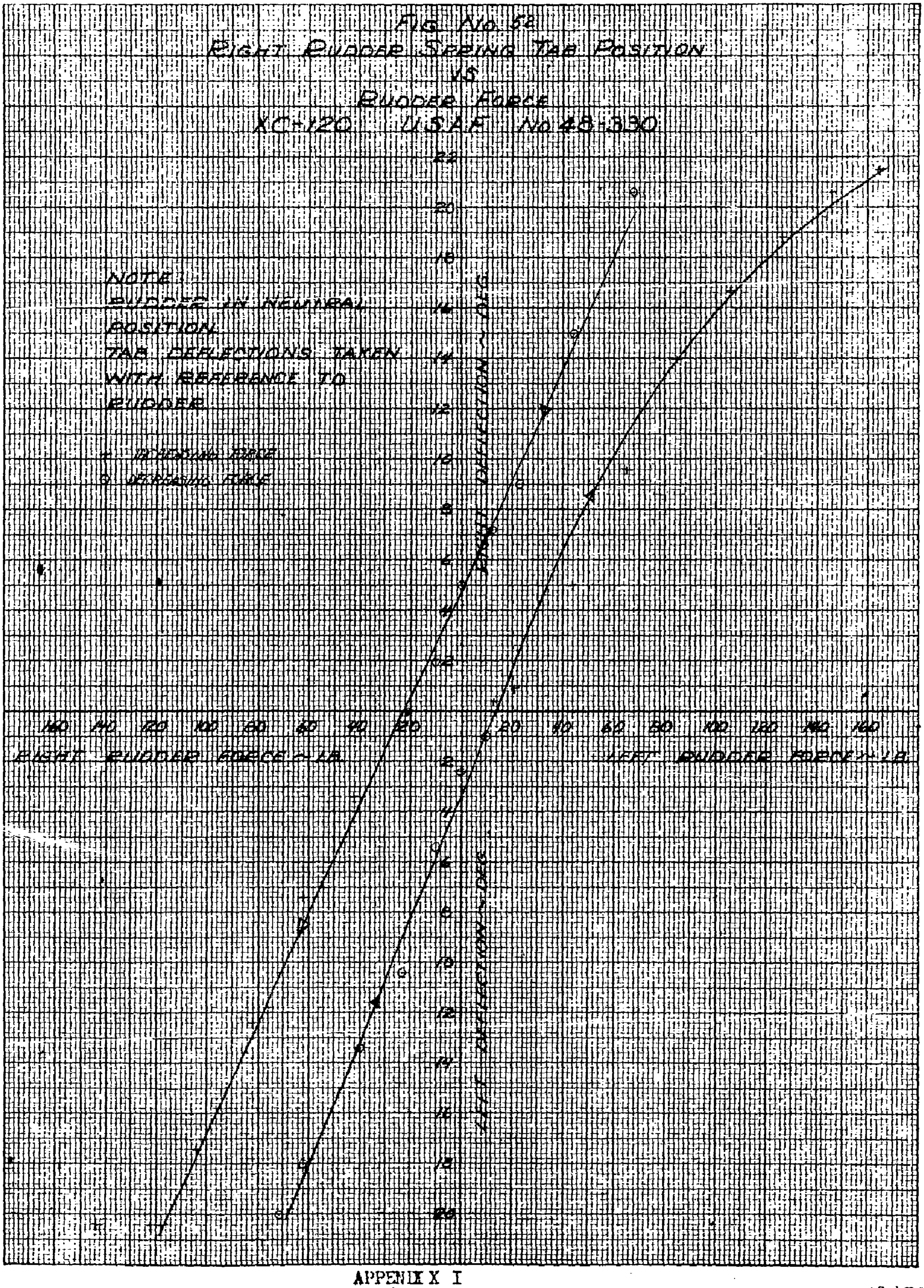
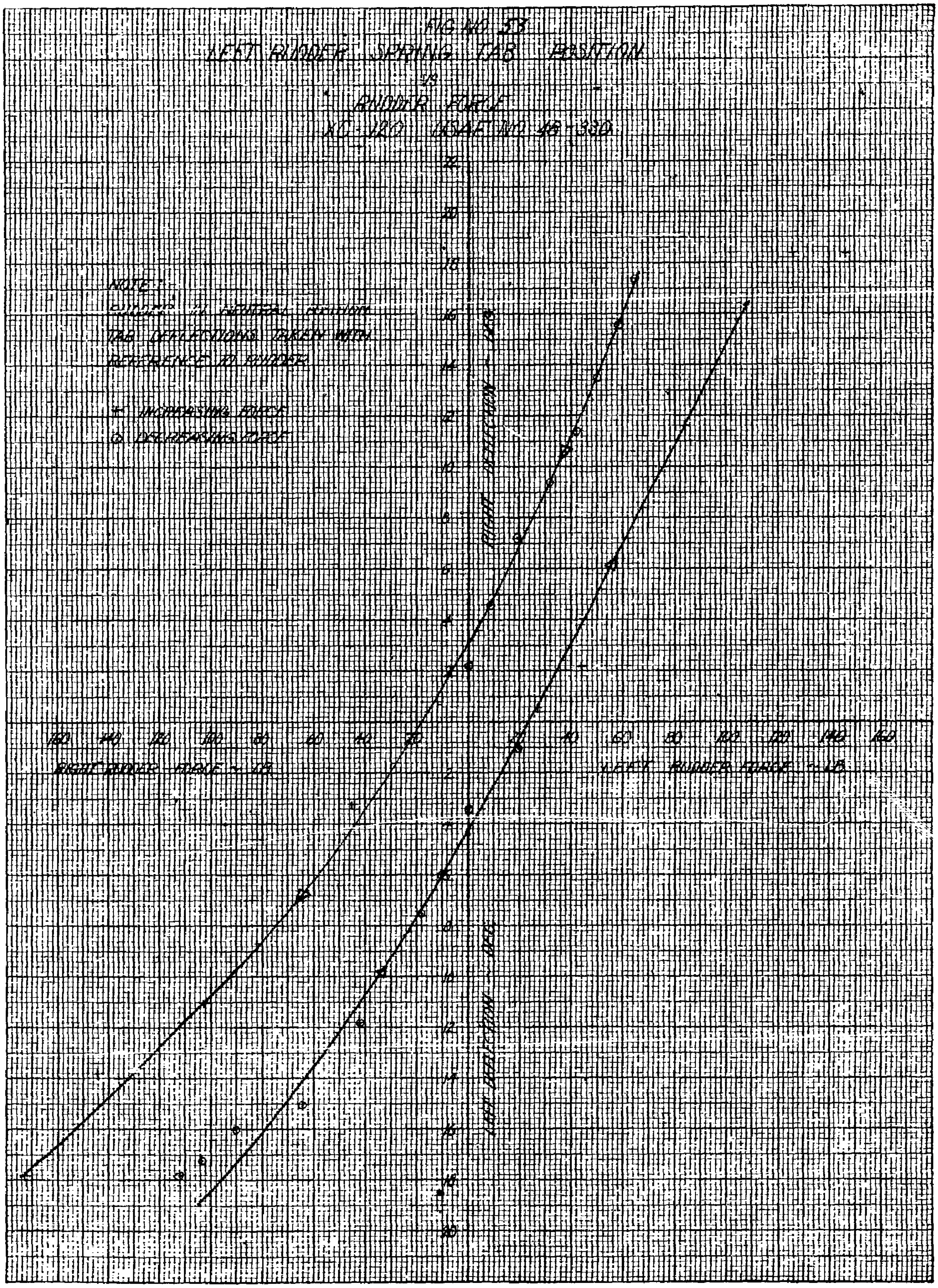


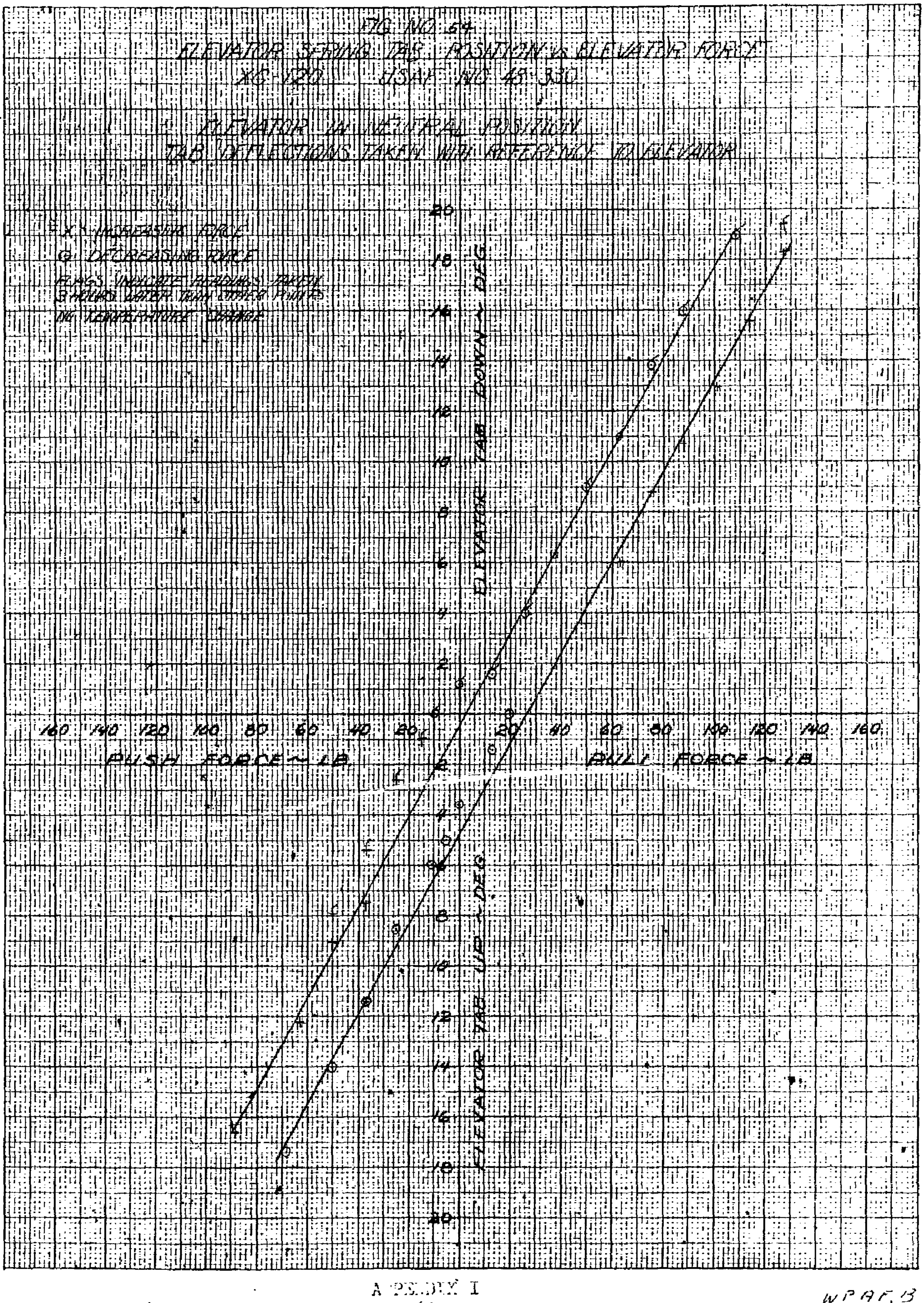
FIG. NO. 51
DYNAMIC DIRECTIONAL STABILITY
XC-120 USAF NO. 48-330
STICK FIXED POWER APPROACH CONE
PACK ON AND PACK OFF
RUDDER
AILERON
RATE OF ROLL
SIDESLIP
PACK ON
PACK OFF
RUDDER
AILERON
SIDESLIP
RATE OF ROLL
TIME ~ SEC
RIGHT
LEFT



WDAFB
23 JAN 51



WPAFB
29 JAN 51



WPAFB
30 Jan 51

APPENDIX II

1. Instrumentation

2. Dimensions and Design Limits

3. Photographs

1. Instrumentation

Installation of test equipment was made at the factory. After delivery of the airplane, to Wright-Patterson Air Force Base, Area B, the following changes were made:

a. Photobox mirror door was modified to allow observer to watch instruments at the same time pictures were taken.

b. Additional stability instruments were added to the pilot's panel.

c. Servo force indicators and amplifiers were modernized.

d. New type FW-8 camera replaced auto-rewind type.

e. One each AN 5525-1 type resistance bulb was installed in each carburetor air scoop to measure carburetor air temperature.

f. C-10 type temperature indicators were installed in the photobox to indicate carburetor air temperature.

g. Torque system was modified.

h. Original engine thermocouple installation called for cylinder head and cylinder base temperatures on the right engine; however, after Fairchild Aircraft Company had experienced a failure of the right engine, it was decided to instrument only certain cylinder heads of the new engine. This decision was based on tests conducted on C-119B airplane.

i. Fuel flows were recorded from a Revere Blue Top totalizer installed on the right engine, however, difficulties were experienced with the by-pass system, and this was later modified by replacing the 1.5 pound by-pass spring with a 5 pound by-pass spring.

j. The standard air-speed system was approximately 35 mph in error; therefore, the swivel air-speed system was used throughout the test program. An F-51 pacer airplane was used to calibrate the swivel system, with both the pack on and pack off of the XC-120 airplane.

2. Dimensions, Design Limits and General Information

a. Wing Group

Airfoil Section Designation

Root, Center Section	NACA	2418
Tip, Outer Panel	NACA	4409

	Dimensions	Angular Movement
Wing	1447 sq ft	-
Incidence, Root	7.0°	-
Incidence, Tip	3.0°	-
Aspect Ratio	8.25	-
Mean Aerodynamic Chord Length	168 in.	-
Ailerons (Right)	112 sq ft	Up 23° Dn 11°
Trim Tab (Right)	5 sq ft	Up 17° Dn 30°
Flaps	100 sq ft	T.O. 15° Full Dn 40°
b. Tail Group		
Horizontal Stabilizer	232 sq ft	-
Elevator (Static Position)	113 sq ft	Up 35.7° Dn 24.5°
Trim Tab	5 sq	Up 12° Dn 22°
Spring Tab	4 sq ft	Up 17° Dn 28°
Vertical Fin	199 sq ft	-
Fin	114 sq ft	-
Rudders	84 sq ft	L 9.4° R 15.1°
Trim Tabs	8 sq ft	L 15° R 15°
Spring Tab	4 sq ft	L 17° R 17°

c.

Fuselage Length (Pack Attached)	56 ft
Fuselage Length (Without Pack)	51 ft
Overall Length	83 ft
Height	25 ft
Cargo Section Height (Including Monorail)	8 ft
Cargo Section Length	37 ft
Cargo Section Width (Maximum)	10 ft
Cargo Section Volume	2700 cu ft

d. Structural Limitations

Limit diving speed (Pack Attached)	313 mph
Limit diving speed (Without Pack)	313 mph
Limit speed wing flap extended	160 mph
Limit maneuvering load factor (Pack Attached)	+3.0 g -1.5 g
Limit maneuvering load factors (Without Pack)	+3.0 g -1.5 g
Limit gust load factor (Pack Attached) (64,000 pounds)	+2.52 g -0.52 g
Limit gust load factor (Without Pack) (55,000 pounds)	+2.93 g -0.93 g

Note: Structural limitations were considered to be 80% of design limits pending static load test.

APPENDIX II

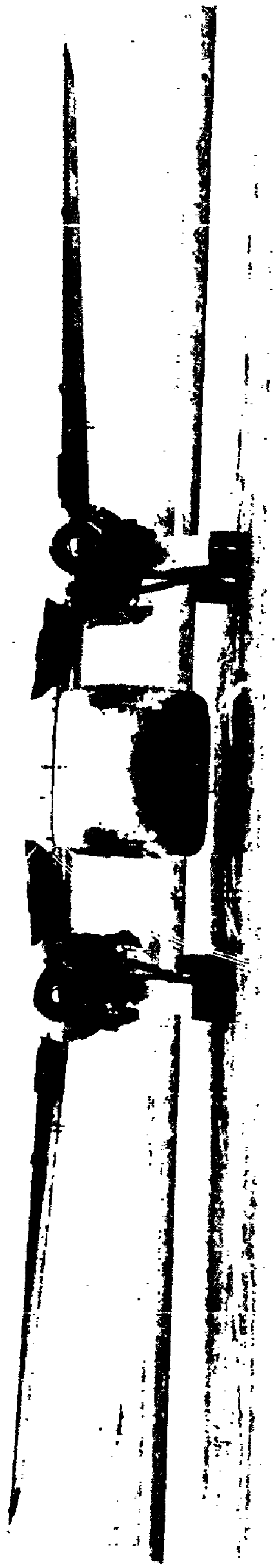
e. Engine Specifications

Rating	Mixture	Blower Ratio	BHP	RPM	MP "Hg	Torque PSI	Altitude Ft
Take-off	Rich (5 min wet)	Low	3500	2700	61.5	–	S.L.
Take-off	Rich (5 min dry)	Low	3250	2700	61.5	228	S.L.
Military	N	Low	3250	2700	60.5	228	2,000
Military	N	High	2500	2700	55.0	175	17,000
Normal	N	Low	2650	2550	49.0	197	6,500
Normal	N	High	2300	2550	50.0	171	18,000

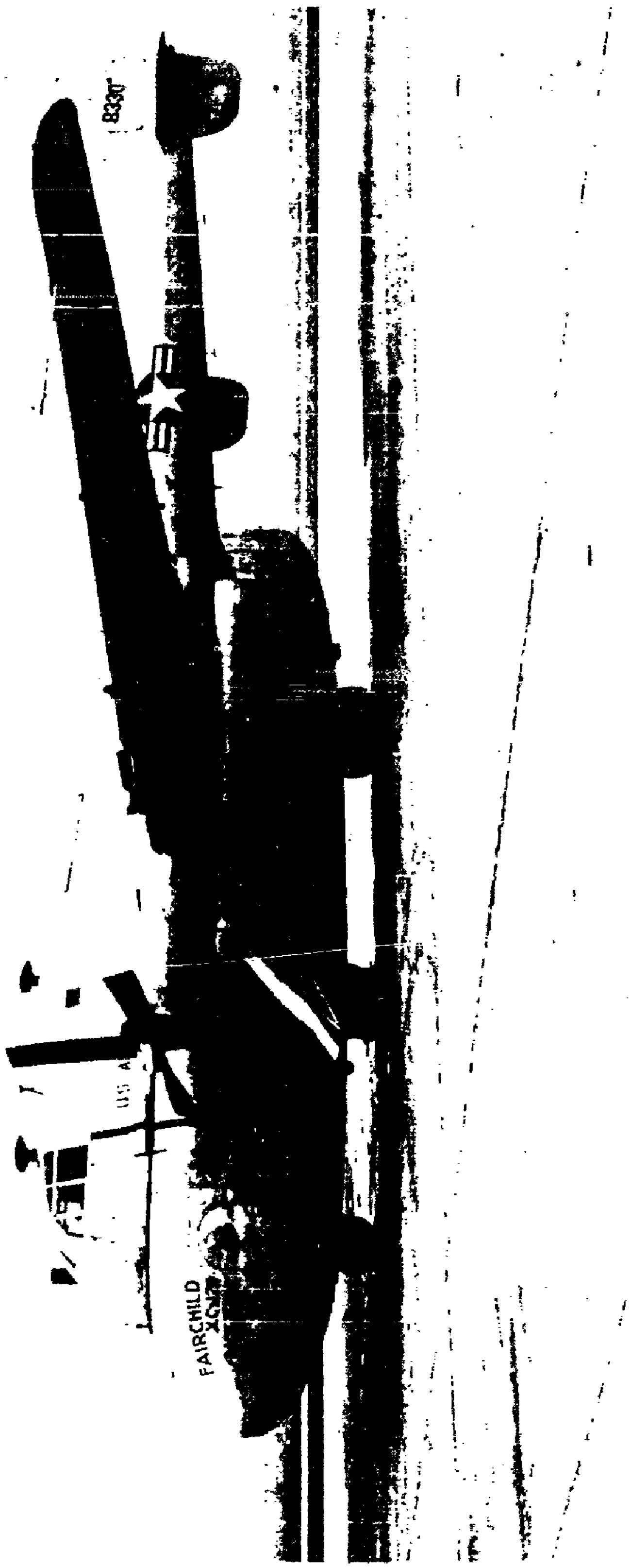
Cylinder Head Temperature Limits:

85% NRP and above	250°
Below 85% NRP	232°

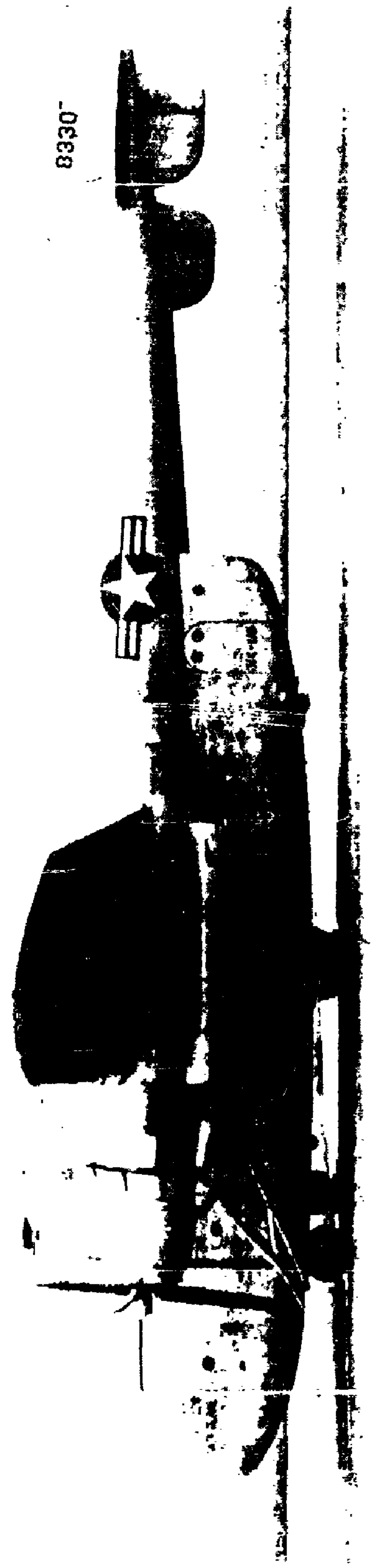
BHP = RPM x Torque x K
K = Torque Constant = .00528



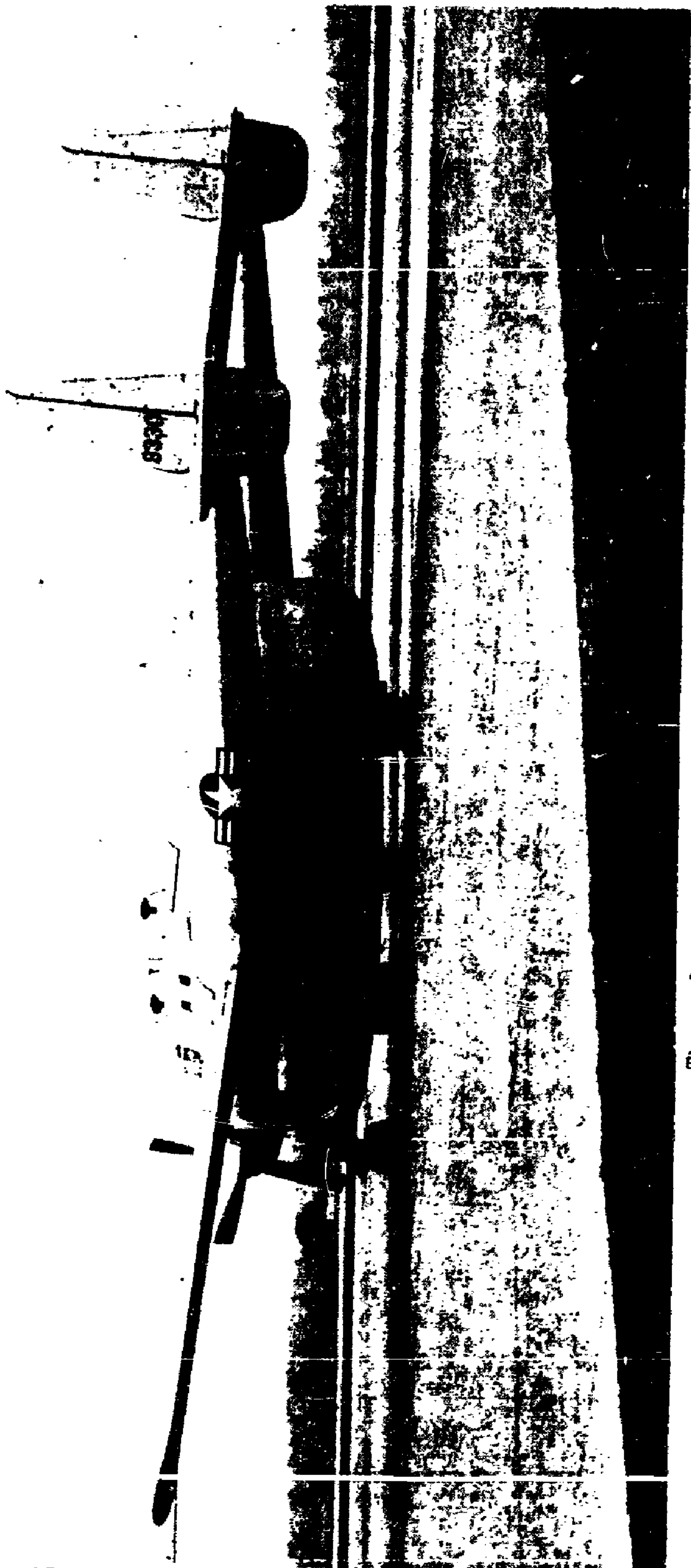
Front View (Pack On)



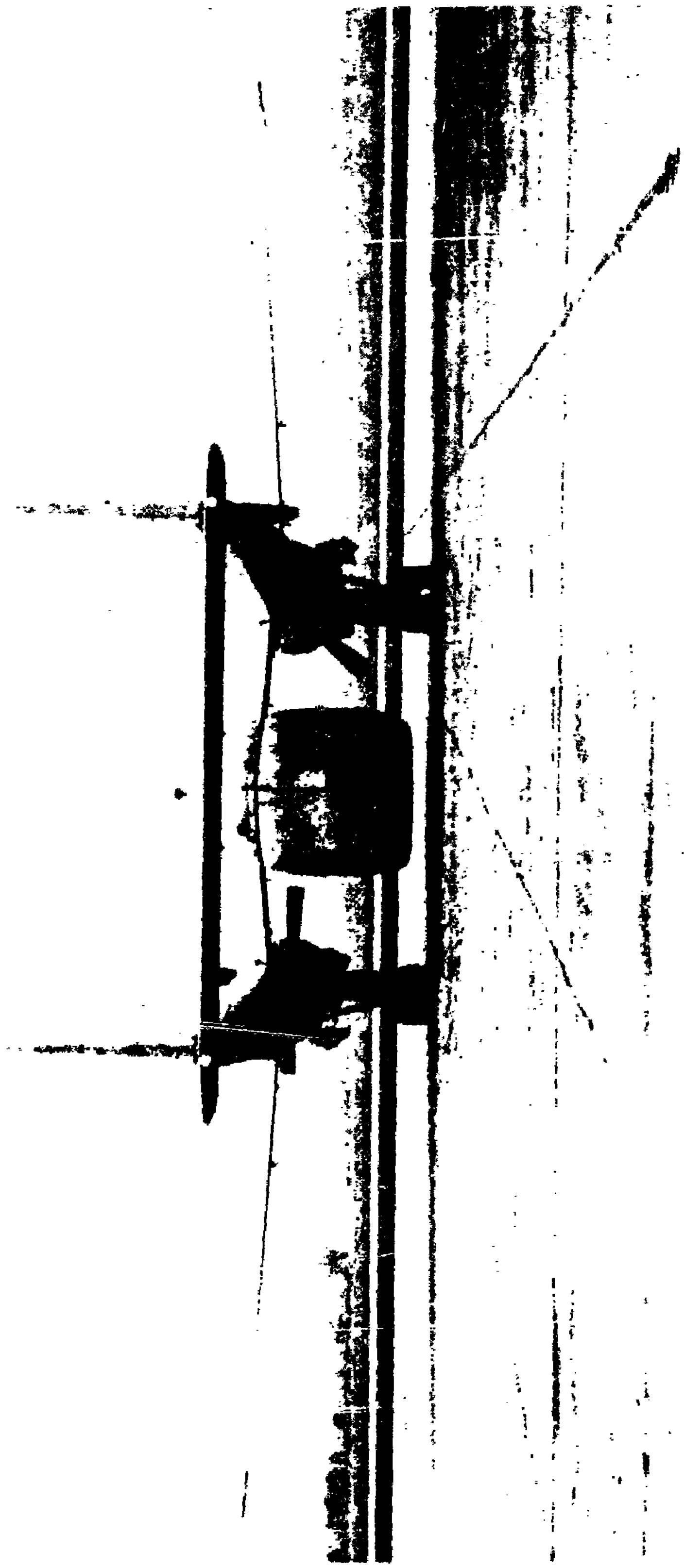
Three-Quarter Left Front View (Pack On)



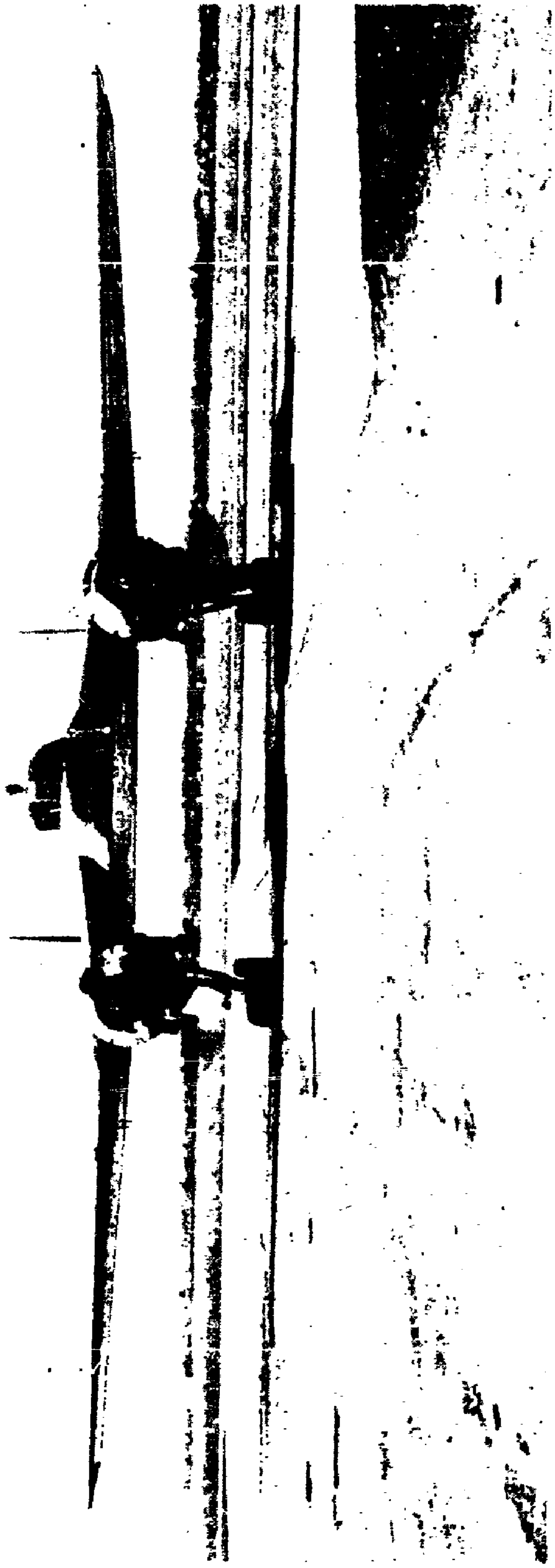
APPENDIX II



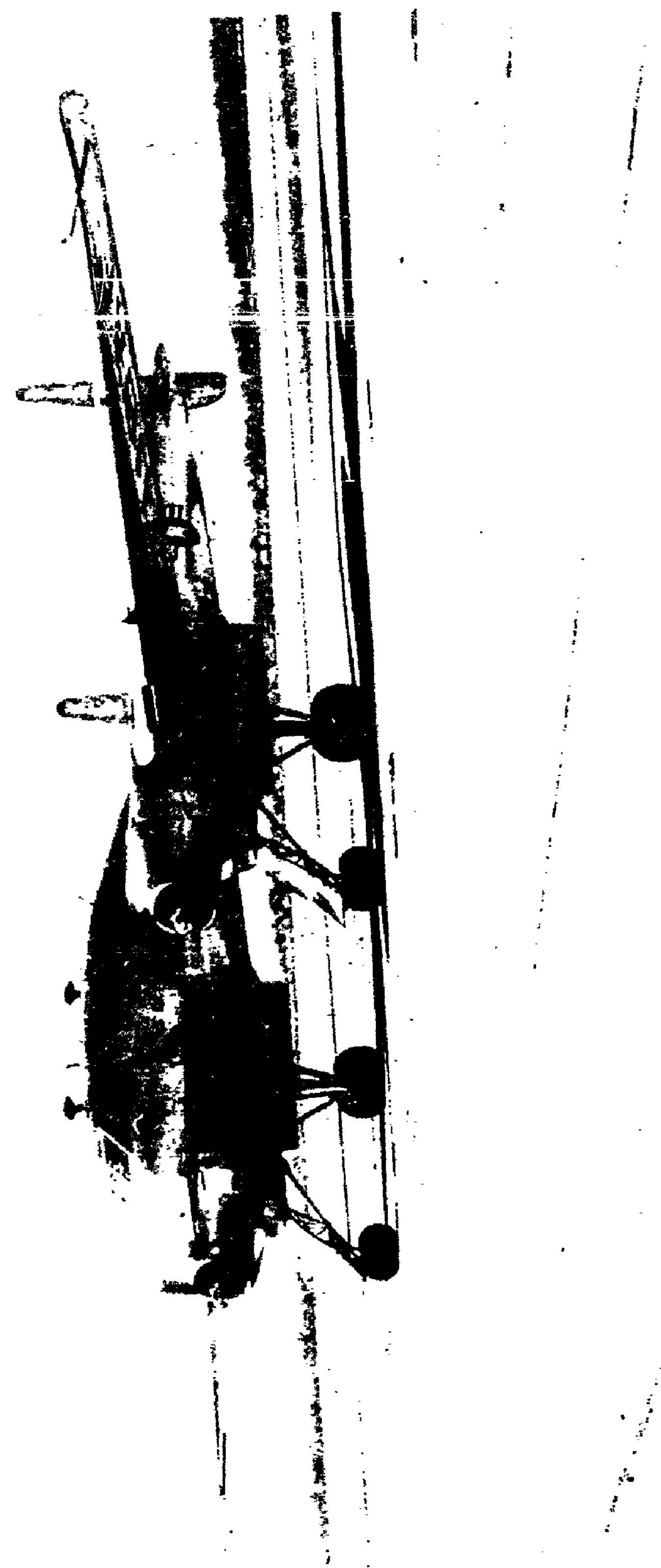
Three-Quarter Left Rear View (Pack On)



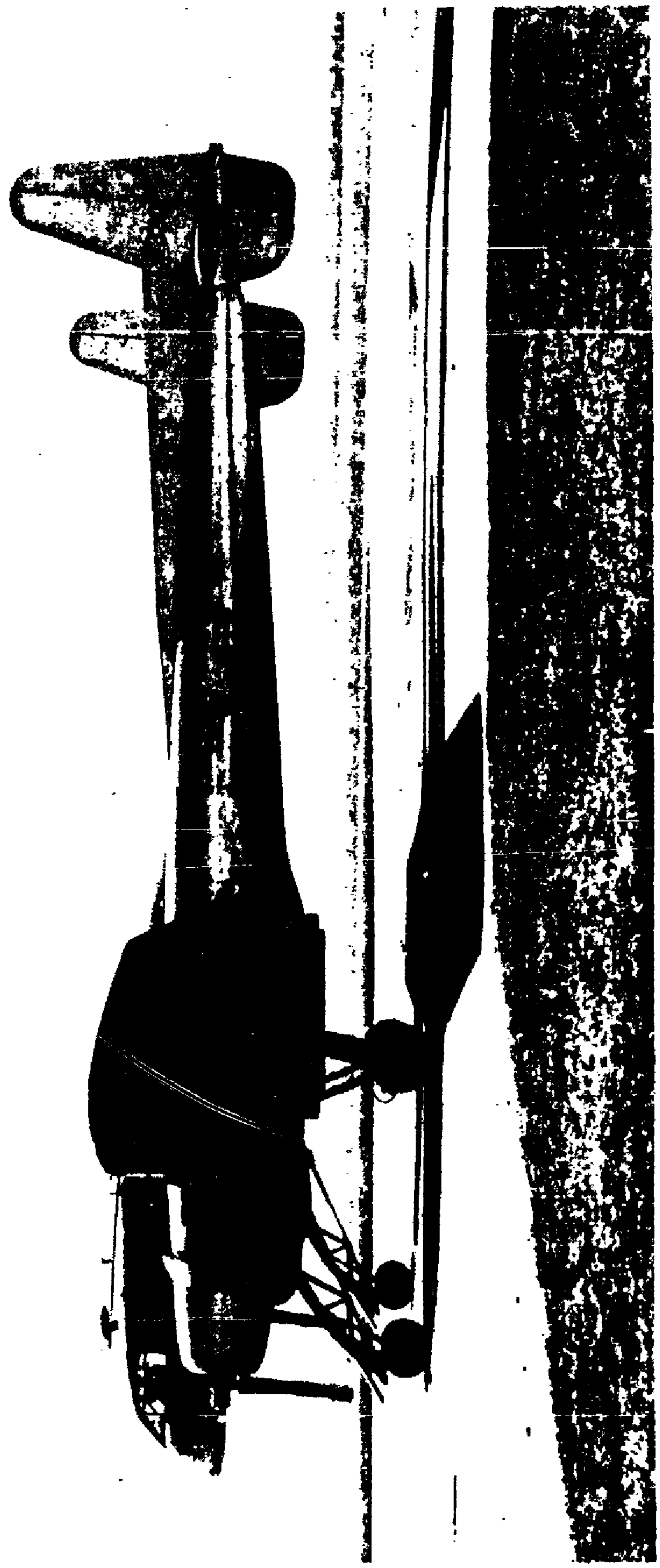
Rear View (Pack On)



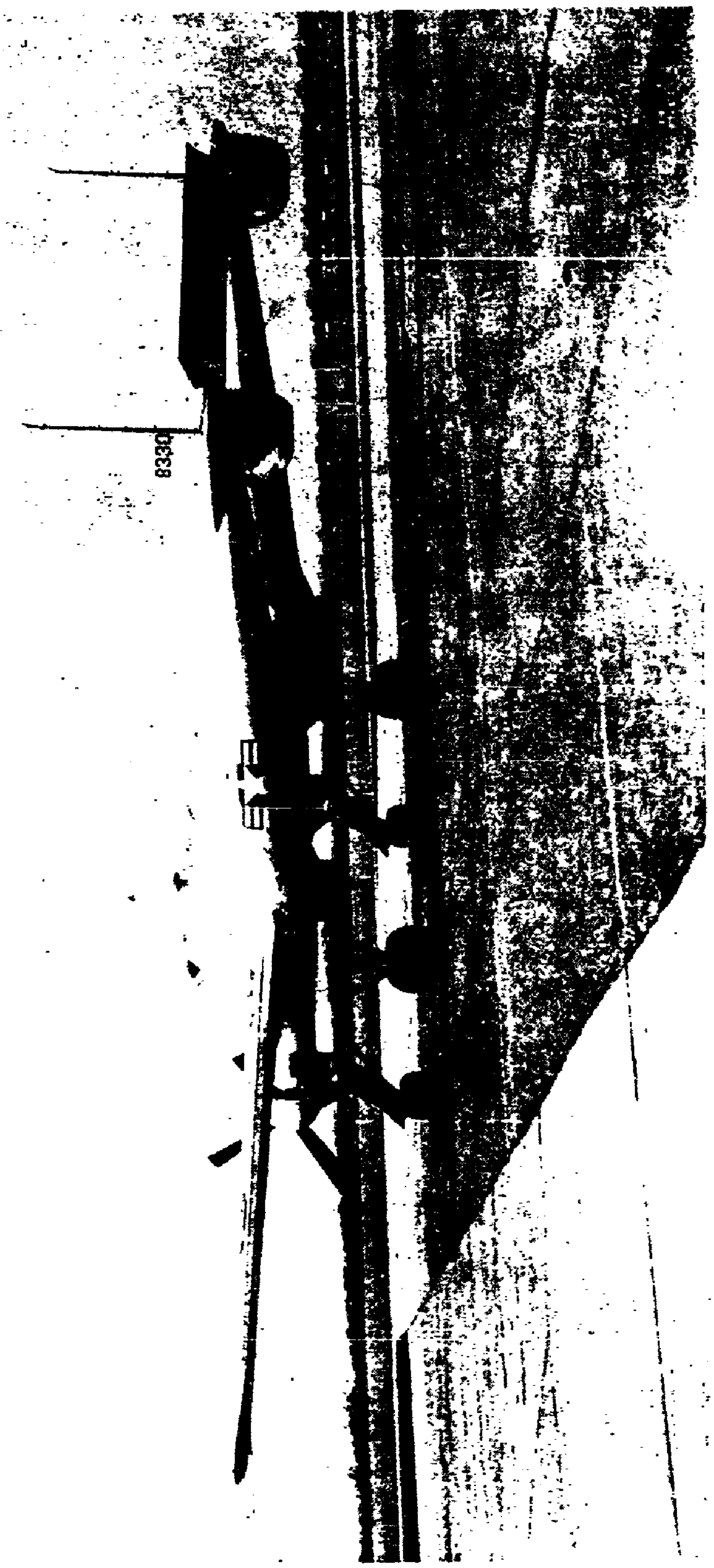
Front View (Pack Off)



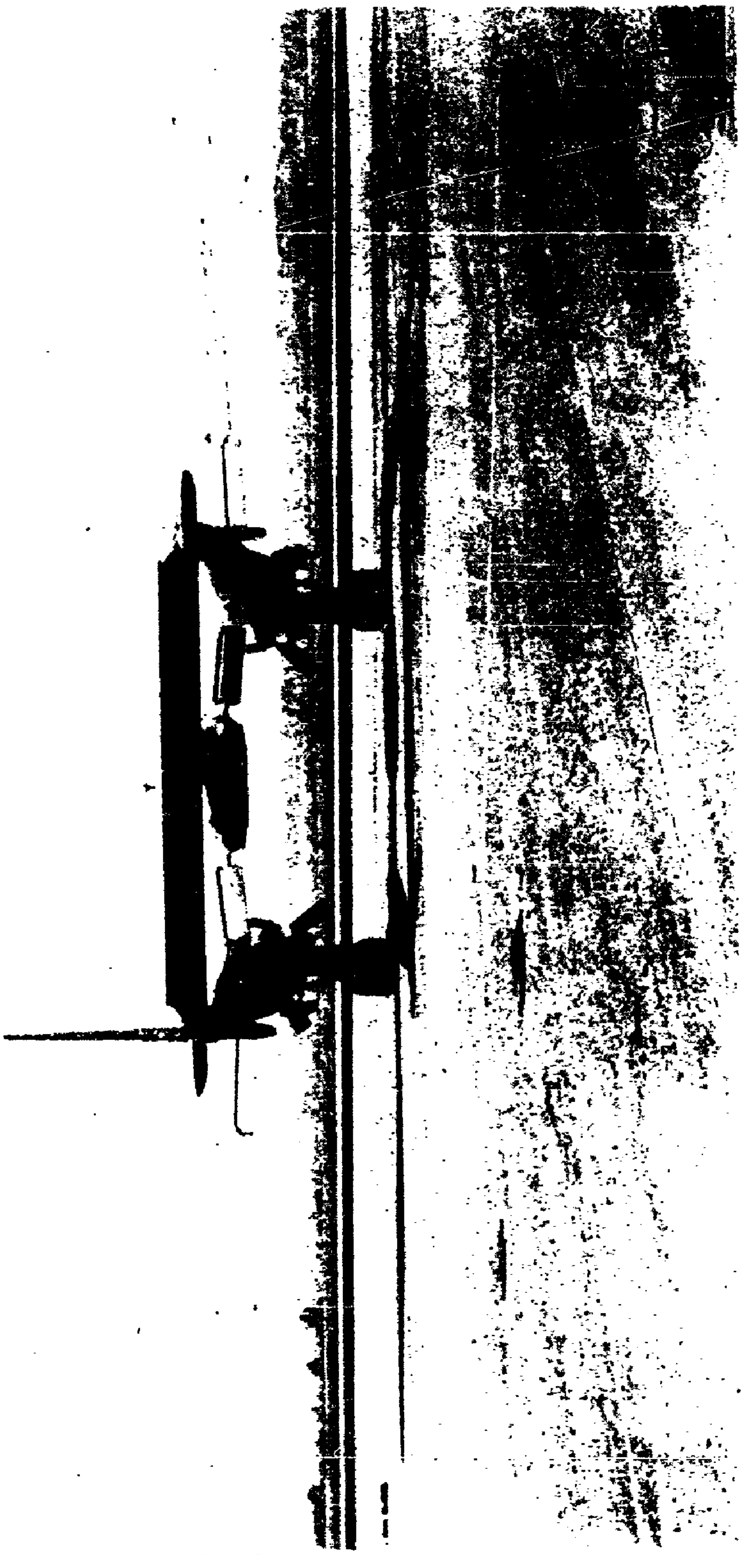
Three-Quarter Left Front View (Pack Off)



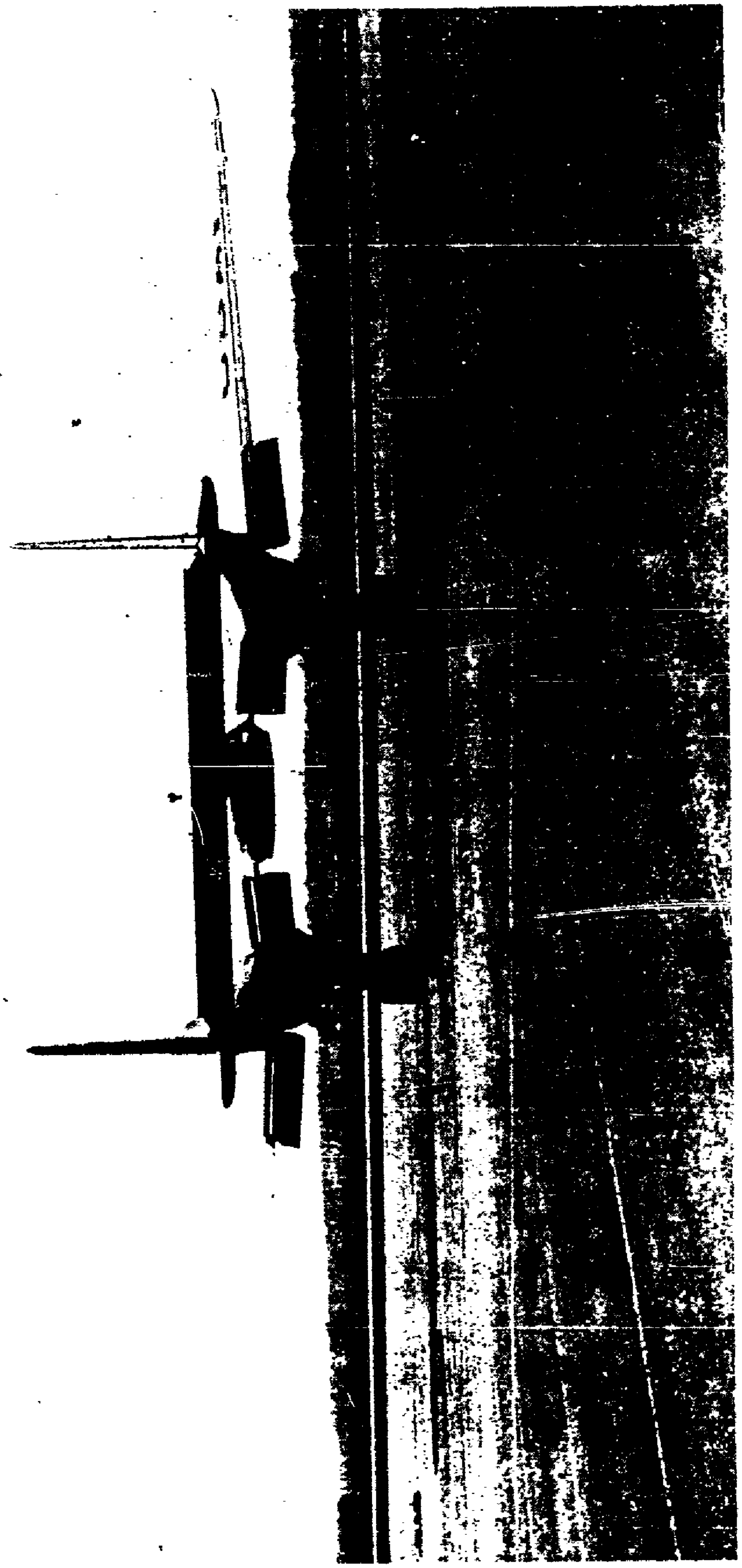
Left Side View (Pack Off)



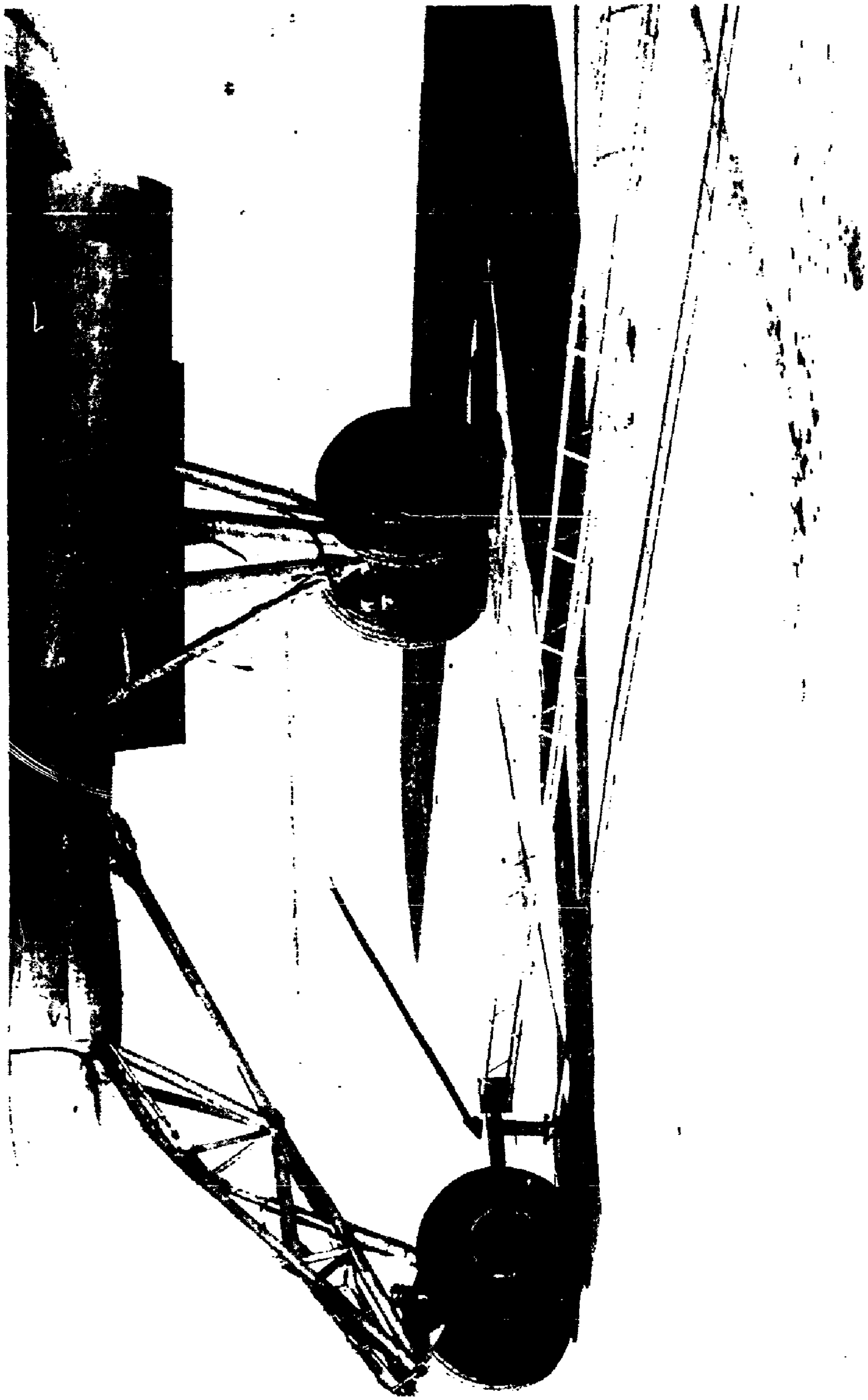
Three-Quarter Left Rear View (Pack Off)



Rear View (Pack Off, Flaps T.O. Position)



Rear View (Pack Off, Flaps Full Down)



Towing Unit (Symmetrical)

APPENDIX II

APPENDIX III

Original Data Corrected for Instrument Error Only

Flight Log of Test Flights Only

Flight No. & Configuration	Time Hr & Min	Total Time Hr & Min	Date	Remarks
1 (pack on)	2:45	2:45	18 Feb 51	Sawtooth climb & dynamic directional
2 (pack on)	2:15	5:00	19 Feb 51	Air-speed calibration, stalls and nose-wheel lift-off speed
3 (pack on)	0:40	5:40	23 Feb 51	Take-offs and Landings
4 (pack on)	2:50	8:30	23 Feb 51	Check climb, speed power at 18,000 feet, sideslips, dynamic directional at 10,000 feet and stalls
5 (pack on)	2:20	10:50	24 Feb 51	Single-engine climb speed power at 10,000 feet
6 (pack on)	0:20	11:10	24 Feb 51	Flight aborted because of fuel leak
7 (pack on)	1:30	12:40	5 Mar 51	Static longitudinal stability, F_s/g
8 (pack on)	2:05	14:45	6 Mar 51	Static longitudinal stability, F_s/g and cowl flap drag
9 (pack off)	2:10	16:55	7 Mar 51	Sawtooth climb
10 (pack off	2:15	19:10	8 Mar 51	Single-engine climb, speed power at 10,000 feet and cooling
11 (pack off)	2:45	21:55	8 Mar 51	Check climb, speed power at 18,000 feet, air-speed calibration and single-engine stability
12 (pack off)	1:05	23:00	9 Mar 51	Take-offs and landings
13 (pack off)	2:00	25:00	10 Mar 51	Static longitudinal stability, F_s/g

APPENDIX III

Flight No. & Configuration	Time Hr & Min	Total Time Hr & Min	Date	Remarks
14 (pack off)	1:55	26:55	11 Mar 51	Static longitudinal Stability, trim changes and sideslips
15 (pack off)	2:00	28:55	12 Mar 51	Static longitudinal stability, F_s/g, nose-wheel lift-off speed
16 (pack on)	0:40	29:35	16 Mar 51	Take-off and landings
17 (pack on)	3:30	33:05	20 Mar 51	Sideslip, longitudinal trim change, F_s/g and static longitudinal stability
18 (pack on)	3:00	36:05	5 Apr 51	Ferry trip and speed power and fuel flows at 10,000 feet
19 (pack on)	3:00	39:05	6 Apr 51	Ferry trip and speed power and fuel flows at 10,000 feet

Memorandum Report No. WCT-2344

FLIGHT DATA SHEET

XC-120 AF No. 48-33? Flight No. 5 Date 24 FEB. 51

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: SPEED POWER @ 10,000 FT. PACK ON

RUN NO.	1	2	3	4	5	6	7	8	9	10 **	11
TIME (min)											
ALT. (ft)	10060	10,000	10030	9990	10040	10010	9950	9990	9950	9850	9950
IAS (mph)	197	207.5	195	191	183	170	161	151	140.5	115	129
M.P. #1	56.8	50.1	41.6	39.3	38.6	38.5	37.4	37.2	36.5	34.7	36.0
("Hg) #2	56.3	50.5	41.8	40.2	38.8	38.7	37.3	36.4	36.4	37.6	35.9
Torque #1	185	181	173	165	155	158	156	157	155	151	153
(psi) #2	183	184	175	167	162	162	158	159	158	153	155
RPM #1	2700	2550	2460	2360	2260	1980	1810	1640	1560	1480	1530
#2	2700	2555	2450	2360	2260	1980	1820	1630	1560	1480	1530
FAT (°C)	-5	-5	-5	-5	-5	0	0	-1	-1	-1	-1
CAT #1	3	4	3	3	2	2	2	1	0	0	0
(°C) #2	8	8	8	7	6	6	6	5	4	4	4
COWL #1	8.1	1.3	2.5	→							
FLAP* #2 (INCHES OPEN)	7.9	1.0	1.5	→							
OIL SHUTTER #1	9	→									
(deg open) #2	17	→									
TOTALIZER #1	110	143	205	222	237	250	260	274	298	308	317
(gals used) #2	197	215	274	288	303	312	328	345	377	389	402
Cn	23	25	27, 28		29, 30	31, 32	33, 34	35	36	37, 40	41, 42
MIXTURE	R	N	→								
FUEL FLOW #1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	
(#/hr) #2	[illegible]	[illegible]	[illegible]	[illegible]	193	[illegible]	[illegible]	[illegible]	[illegible]		

FUEL S.G. 5.87

FUEL TEMP. 4°C

START ENG. 09:50

TAKE OFF 10:15

GR. BRK. ALT. 400' (29.92)

" " FAT. 3° C

FLIGHT TIME 2+20

GROSS WT @ START ENGINES 63,915 LBS.

* inches open ** RATE OF DESCENT 100 FT/MIN.

APPENDIX III

MCRE Form 20 (1 Jun 46)

This form replaces MCRF Form No. 52, 3 Jan 46, existing stock of which will be used until exhausted.

Air Force-WPAFB

Memorandum Report No. WCT-2344

FLIGHT DATA SHEET

XC-1... AF No. 4?-... Flight No. 1B Date 5 APRIL, 1951.

ALL DATA CORRECTED FOR POSITION ERROR ONLY

TEST: SPEED - POWER 10,000 FT. PACK ON

RUN NO.	1	2
TIME (min)	—	—
ALT. (ft)	10,040	10,040
IAS (mph)	202	169.5
M.P. #1	50.3	41.2
("Hg) #2	45.7	40.2
Torque #1	183	170
(psi) #2	182	165
RPM #1	2500	2360
#2	2485	2345
FAT (°C)	1	1
CAT #1	4	3
(°C) #2	8	7
COWL #1	2	2
FLAP* #2	2	2
OIL SHU TER #1	30	30
(deg open) #2	30	30
TOTALIZER #1	161	182
(gals used) #2	151	192
Cn	3	4,5
MIXTURE	N	N
FUEL FLOW #1	N.G.	N.G.
(#/hr) #2	1492	1015
	62000	61750

FUEL S.G. 5.81

FUEL TEMP. 16°C

START ENG. 1320

TAKE OFF 1334

GR.BLK.ALT. 675 (29.92)

" " FAT. 15°

FLIGHT TIME 3 HR

* inches open

APPENDIX III

5

Memorandum Report No. MCT-2344

FLIGHT DATA SHEET

XC-12? AF No. 48-330 Flight No. 19 Date 6 APRIL, 1951

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: SPEED - POWER 10,000 FT. PACK ON

RUN NO.	1	2	3	4	5	6	7
TIME (min)	—	—	—	—	—	—	—
ALT. (ft)	10,040	→					→
IAS (mph)	188.5	179.5	171	156.5	132	212	206
M.P. #1	41.9	39.8	39.0	38.9	37.8	56.5	52.5
("Hg) #2	40.6	38.9	37.7	37.6	36.1	56.5	50.2
Torque #1	168	158	156	155	153	184	187
(psi) #2	170	158	158	160	157	189	190
RPM #1	2370	2265	2100	1810	1630	2695	2510
#2	2370	2265	2100	1820	1615	2705	2510
FAT (°C)	4	3	3	2	1	3	2
CAT #1	7	6	5	5	4	6	5
(°C) #2	N.G.	→					→
COWL #1	2	→					→
FLAP* #2	2	→					→
OIL SHUTTER #1	30	→					→
(deg open) #2	30	→					→
TOTALIZER #1	98	116	130	153	163	248	198
(gals used) #2	100	118	133	161	175	258	213
Cn	21	23	25	28	29	32	31
MIXTURE	N	→			→	R	N
FUEL FLOW #1	N.G.	→					→
(#/hr) #2	955	853	806	689	594	2338	1712
GROSS TEST WT. (LBS)	62700	62500	62300	62100	61850	60870	61400

FUEL S.G. .58

FUEL TEMP. —

START ENG. 1415

TAKE OFF 1430

GR. BRK. ALT. — (29.92)

" " FAT. 22°

FLIGHT TIME 3 HR

* inches open

APPENDIX III

MCRF Form 70 (3 Jan 45)

This form replaces MCRF Form No. 5? ... Jan 46, existing stock of which will be used until exhausted.

Air Force-Wright Field

Memorandum Report No. MCT-2344

FLIGHT DATA SHEET

XC-12 AF No. [illegible] Flight No. 10 Date 8 MARCH 1951

[illegible]

Test: Level Flight @ 10000

Pod Off

RUN NO.	4	5	6	7	8	9	10	11	12	13	14
TIME											
PRESS. ALT.	10050										10050
IAS	200	196	191	185	184	174	165	154	141	137	120
MAN. PRESS. #1	40.1	38.6	38.1	37.2	36.4	36.4	36.2	35.6	33.0	31.8	28.6
(" Hg) #2	39.4	38.5	37.7	36.8	35.4	34.7	34.7	34.8	33.0	30.8	28.4
Torque #1	166	158	156	156	152	153	154	154	148	139	130
(psi) #2											
RPM #1	2360	2310	2250	2110	2010	1810	1620	1460	1400	1380	1380
#2											
FAT (°C)	2	2	1	0	-1	-3	-3	-3	-3	-3	-3
CAT #1	4	4	3	2	0	-1	-2	-3	-3	-3	-3
(°C) #2	8	8	7	6	4	2	2	1	1	0	1
COWL #1	2.5	→									2.5
FLAP* #2											
OIL COOLER #1	33	34	34	34	34	35	35	35	35	35	36
* (deg open) #2											
TOTALIZER #1	237	248	253	265	274	282	291	298	304	310	318
(gals used) #2	325	346	360	373	382	393	401	410	415	422	431
Cr											
MIXTURE	NORMAL	→									NORMAL
FUEL FLOW #1											
(#/hr) #2											
Gross Weight ~ Lbs	51750	51500	51400	51250	51100	51000	50950	50850	50750	50700	50600

FUEL S.G. ______

FUEL TEMP. ______

START ENG. ______

TAKE OFF ______

[illegible] ______ (29.92)

" " FAT ______

FLIGHT TIME ______

* Inches open

APPENDIX III

Memorandum Report No. MCT-2344

FLIGHT DATA SHEET

XC-12? AF No. 4?-?3 Flight No. 4 Date 23 FEB. 51

SPEED POWER @ 18,000 FT.
PACK ON

RUN NO.	1	2
TIME (min)		
ALT. (ft)	18250	18230
IAS (mph)	186.5	181
M.P. #1	52.1	50.1
("Hg) #2	52.3	50.2
Torque #1	152	162
(psi) #2	153	166
RPM #1	2750	2540
#2	2750	2550
FAT (°C)	-14	-14
CAT #1	-12	-12
(°C) #2	-8	-8
COWL #1	2	2
FLAP* #2	2.3	2.3
OIL SHUTTER #1	28	28
(deg open) #2	28	28
TOTALIZER #1	366	413
(gals used) #2	366	413
Cn	129	131
MIXTURE	R	N
FUEL FLOW #1		
(#/hr) #2		

FUEL S.G. 5.82

FUEL TEMP: 11.5°C

START ENG. 14:00

TAKE OFF 14:30

GR. BLK. ALT. 325' (29.92)

" " FAT. 7°C

FLIGHT TIME 2+50

GROSS WT @ START ENGINES 63,775 LBS.

* inches open

APPENDIX III

8

FLIGHT DATA SHEET

XC-120 AF No. 48-330 Flight No. 2 Date 19 Feb., 1951

Airspeed Calibration at 10,000 Ft.

RUN NUMBER	CONFIGURATION	XC-120 IAS_{ie} (mph) pilot swiv. sys.	XC-120 IAS_{ie} (mph) Obs. swiv. sys.	F-51 Pacer V_e (mph)	XC-120 GROSS WEIGHT
1	CLEAN	199.5	—	204.3	62,000
2		190.0	190.5	196.2	
3		—	180.0	183.9	
4		159.0	160.5	168.1	
5		149.5	151.0	154.5	
6		141.0	142.5	148.0	
7		130.0	131.5	134.0	
8		119.5	118.5	125.0	
9		113.0	113.5	115.7	61,000
1	T.O.	120.0	121.5	124.1	61,000
2	T.O.	110.0	111.0	113.8	61,000
1	LAND-	119.0	119.5	121.8	60,800
2	LAND-	110.5	111.0	113.4	60,800
		PACK ON			

NOTE:

Airspeed calibration was obtained by having the XC-120 airplane paced by a calibrated pacer F-51 airplane, USAF No. 5479

APPENDIX III

MCRF Form 20 (3 Jun 46)

This form replaces MCRF Form No. 52, 3 Jun 46, existing stock of which will be used until exhausted.

Air Force-WPAFB-[illegible]

7 Memorandum Report ...

FLIGHT DATA SHEET

AIRSPEED CALIBRATION (@ 16,000 FT)
PACK OFF

XC-120 AF No. 48-330 Flight No. 11 Date 9 MARCH 1951

RUN NUMBER	CONFIGURATION	XC-120 IAS (mph) PILOT'S SWIV. SYS.	XC-120 IAS (mph) OBS. SWIVEL SYS.	F-51 PACER V_e - mph	XC-120 GROSS WEIGHT - lbs.
1	CLEAN	229	—	234.5	51800
2		219	—	224.5	
3		207.5	—	212.5	
4		197.5	—	202.5	
5		189.5	—	194.5	
6		179.5	—	183.5	
7		171	—	175.5	
8		159	—	163	
9		151	—	155.5	
10		141.5	—	145	
11		130	—	133.5	
12		120	—	124.5	
13	CLEAN	112		114.5	50900
1	T.O.	139.5		143	50800
2		130.5		133	
3		119		122.5	
4		110.5		114	
5	T.O.	100.5		104.5	50600
1	LAND.	140		143	50500
2		130		133	
3		120		124	
4		110	—	114	
5	LAND.	100	—	104	50200

APPENDIX III

8

FLIGHT DATA SHEET

Memorandum Report No. WCT-2344

XC-1[illegible] AF No. [illegible] Flight No. 11 Date 9 March 1951

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: Check Climb to Service Ceiling

POD OFF

RUN NO.												
TIME (min)	0	.833	1.65	2.50	3.18	4.18	5.00	5.88	6.90	7.97	9.02	10.15
ALT. (ft)	3950	4950	5950	6950	7950	8950	9950	10950	11950	12960	13970	14980
IAS (mph)	118	129	131	131	129	131	127	131	128	128	126	126
M.P. ("Hg) #1	49.7	49.8	49.8	48.6	49.8	49.6	49.6	49.5	49.4	49.2	49.2	49.4
M.P. ("Hg) #2												
Torque (psi) #1	195	197	199	198	192	188	186	181	179	177	175	174
Torque (psi) #2												
RPM #1	2575	2575	2575	2575	2580	2580	2590	2580	2590	2590	2590	2590
RPM #2												
FAT (°C)	2	0	-2	-2	-2	-3	-4	-4	-4	-7	-9	-10
CAT (°C) #1	-4	0	-2	-1	-1	-3	-3	-3	-4	-7	-8	-10
CAT (°C) #2												
COWL FLAPS* #1	8.2 →											8.2
COWL FLAPS* #2												
OIL SHUTTER #1 (deg open)	35 →											35
OIL SHUTTER (deg open) #2												
[illegible] (gals used) #1		77	86	94	103	111	120	128	137	154	163	171
[illegible] (gals used) #2												
Cn												
MIXTURE	NORMAL →											NORMAL
FUEL FLOW (#/hr) #1												
FUEL FLOW (#/hr) #2												
GROSS WEIGHT-LBS		54550	54500	54450	54400	54350	54300	54250	54200	54100	54050	54000

FUEL S.G. 5.8

FUEL TEMP. 14.5°C

START ENG. 14:43

TAKE OFF

GR. BAR. ALT. 690' (29.92)

" " FAT. 15°C

FLIGHT TIME 2:45

* inches open

APPENDIX III

11

FLIGHT DATA SHEET

XC-1.. AF No. 4-..   Flight No. 11 (cont'd)   Date 9 March 1951

[illegible]

..... Check Climb & 18,000 Ft Level Flight Point POD OFF

RUN NO.													1
TIME (min)	11.33	12.62	13.82	15.23	16.63	18.27	20.12	22.25	24.75	27.63	29.30	31.47	
ALT. (ft)	16000	17050	18100	19100	20100	21100	22050	23050	24050	25050	25550	26050	18050
IAS (mph)	126	125	123	124	123	123	121	120	119	118	117	117	204
M.P. ("Hg) #1 #2	49.9	49.8	49.6	49.1	47.6	45.6	45.5	43.8	42.3	40.6		39.0	52.2
Torque (psi) #1 #2	173	171	167	162	158	152	146	142	137	132	128	127	155
RPM #1 #2	2590	2590	2590	2590	2590	2590	2590	2580	2580	2570	2580	2570	2700
FAT (°C)	-12	-14	-16	-18	-20	-22	-24	-26	-28	-31	-32	-33	-14
CAT (°C) #1 #2	-12	-11	-13	-15	-16	-18	-21	-23	-25	-27	-28	-29	-11
COWL FLAP* #1 #2	8.2 →											8.2	1.0
OIL SHUTTER (deg open) #1 #2	35 →											35	30
TOTAL FUEL (gals used) #1 #2	188	197	214	231	248	265	282	299	325	351		376	488
CH													
MIXTURE	NORMAL →											NORMAL	RICH
FUEL FLOW (#/hr) #1 #2													
GROSS WEIGHT-LBS	53900	53850	53750	56650	53550	53450	53350	53250	53100	52950	~	52800	52150

FUEL S.G. ____

FUEL TEMP. ____

START ENG. ____

TAKE OFF ____

Gh.BRK.ALT. ____ (29.92)

" " FAT. ____

FLIGHT TIME ____

APPENDIX III

* inches open

Memorandum Report No. MCT-23 44

FLIGHT DATA SHEET

XC-12 AF No. [illegible] Flight No. 4 Date 23 FEB. 1951

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: CHECK CLIMB PACK ON

PAGE 1 OF 2

RUN NO.													
TIME (min)	31.42	31.53	33.62	34.7	—	37.17	38.53	39.83	41.25	42.67	44.42	46.12	48.0
ALT. (ft)	950	1950	2950	3950	4950	5950	6950	7950	8950	9950	10950	11950	12960
IAS (mph)	126	—	133	131	133	131	133	131	131	131	131	130	129
M.P. #1	—	50.1	50.1	50.1	49.9	50.0	49.5	49.2	49.6	49.9	49.9	49.9	49.8
("Hg) #2	—	49.8	49.6	49.6	49.6	49.8	49.5	48.7	50.3	50.0	50.0	50.2	50.1
Torque #1	—	191	191	191	191	197	197	189	188	184	182	180	180
(psi) #2	—	194	194	194	194	195	199	190	189	184	182	178	177
RPM #1	—	2580	2580	2580	2550	2550	2550	2550	2550	2550	2550	2560	2550
#2	—	2575	2575	2575	2550	2550	2550	2550	2550	2550	2550	2550	2535
FAT (°C)	—	2	2	4	0	0	0	-3	-5	-4	-5	-6	-8
CAT #1	—	4	4	4	2	0	0	-2	-2	-3	-4	-5	-7
(°C) #2	—	7	7	7	7	4	2	1	0	0	0	-2	-3
COWL #1	—	8.5 →											
FLAP* #2	—	8.0 →											
OIL COOLER #1	—	30 →											
(deg open) #2	—	30 →											
TOTAL FUEL #1		30	36	42	49	56	64	71	79	88	97	107	117
(gals used) #2		31	36	42	49	56	64	71	78	87	96	106	116
Cn		106	107	108	109	110	111	112	113	114	115	116	117
MIXTURE	N	→											
FUEL FLOW #1													
(#/hr) #2													

FUEL S.G. .582

FUEL TEMP. 11.5°C

START ENG. 1400

TAKE OFF 1413 0

GR. BRK. ALT. 325' (29.92)

" " FAT. 7°C

FLIGHT TIME 2+50 HRS.

GROSS WT. @ START ENGINES 63,775 LBS.

APPENDIX III

13

* inches open

MCRF Form 29 (3 Jun 46)

This form replaces MCRF Form No. 29, 5 Jun 46 existing stock of which will be used until exhausted.

Air Force—WPAFB [illegible]

Memorandum Report No. MCT-2344

FLIGHT DATA SHEET

11

XC-1 AF No. 4?-?? Flight No. 4 Date 23 FEB. 1951

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: CHECK CLIMB (CONT.)

PAGE 2 OF 2

RUN NO.									
TIME (min)	47.92	54.0	—	—	—	01.83	06.67	11.35	14.72
ALT. (ft)	13970	14980	16000	17020	18040	19040	20040	21050	21550
IAS (mph)	128	128	128	126	126	126	126	124	123
M.P. #1	49.8	49.9	49.9	49.9	50.1	50.1	49.0	47.0	46.0
("Hg) #2	50.2	50.0	50.0	50.2	51.4	50.2	48.7	46.7	45.7
Torque #1	179	—	175	175	170	168	160	152	150
(psi) #2	173	—	170	168	166	158	158	146	144
RPM #1	2550	—	2540	2550	2550	2550	2540	2540	2540
#2	2570	—	2530	2535	2530	2570	2530	2530	2530
FAT (°C)	-10	-12	-13	-15	-17	-19	-21	-23	-24
CAT #1	—	-10	—	-13	-14	-16	-17	-21	-21
(°C) #2	—	-6	—	-10	-11	-13	-14	-17	-18
COWL #1		→							
FLAP* #2		→							
OIL SHUTTER #1		→							
(deg open) #2		→							
TOTALIZER #1	124	—	—	141	163	176	192	213	248
(gals used) #2	126	—	—	139	161	175	191	212	247
Cn	118	119	120	121	122	123	124	125	126
MIXTURE	N	→							
FUEL FLOW #1									
(#/hr) #2									

FUEL S.G. ______

FUEL TEMP. ______

START ENG. ______

TAKE OFF ______

GR. BRK. ALT. ______ (29.92)

" " FAT. ______

FLIGHT TIME ______

APPENDIX III

* inches open

14

MCRE Form 29 (1 Jun 46)

This form replaces MCRE Form No. 29, 1 Jun 46, existing stock of which will be used until exhausted.

Air Force WPAFB

FLIGHT DATA SHEET

XC-1 AF No. 48-[illegible] Flight No. 1 Date 18 FEB, 1951

SAWTOOTH CLIMB
AV. ALTITUDE 5000 FT.
PACK ON

RUN NO.	1	2	3	4	5	6	7	8	9
[illegible] (in)	— *	6.75	3.35	2.75	2.35	2.00	2.10	2.45	2.02
Δ ALT. (FT)	5000*	2000	→	→	→	→	→	→	→
IAS (mph)	198.0	179.5	169.5	160.0	150.0	130.0	120.0	110.0	140.0
M.P. #1	49.6	49.0	49.3	49.4	49.3	49.1	49.2	49.3	49.4
("Hg) #2	49.6	49.1	48.8	49.1	49.2	49.1	49.1	49.4	49.3
Torque #1	188	190	192	188	→	→	→	→	→
(psi) #2	194	190	191	189	→	→	→	→	190
RPM #1	2620	2630	2625	→	→	→	2610	2610	2620
#2	2600	2605	2605	→	→	→	2590	→	→
FAT (°C)	7	8	7	6	→	→	→	8	8
CAT #1	9	10	9	9	8	8	6	8	8
(°C) #2	12	13	13	13	12	12	10	12	12
COWL #1	8.2	→	→	→	→	→	→	→	→
FLAP* #2	8.0	→	→	→	→	→	→	→	→
OIL SHUTTER #1	35	→	→	→	→	→	→	→	→
(deg open) #2	35	→	→	→	→	→	→	→	→
TOTALIZER #1	107	150	217	253	272	318	340	358	410
(gals used) #2	113	157	225	260	279	326	347	366	418
Cn									
MIXTURE	NORMAL	→	→	→	→	→	→	→	→
FUEL FLOW #1									
(#/hr) #2									

FUEL S.G. 5.8 #/gal

GROSS WT @ T.O. 63,700 LBS.

FUEL TEMP. 16.5 °C

START ENG. 10:55

TAKE OFF 11:16

GR. BLK. ALT. 590' (29.92)

" " FAT. +8 °C

FLIGHT TIME 2 + 45 HRS.

APPENDIX III

* inches open

*LEVEL FLIGHT

FLIGHT DATA SHEET

XC-12? AF No. ?? Flight No. 9 Date 7 MARCH, 1951

TEST: SAWTOOTH CLIMB
AV. ALTITUDE 10,000 FT.
PACK OFF

RUN NO.		1	2	3	4	5	6	7	8
TIME (min)		—*	3.07	2.08	1.95	1.82	1.83	1.70	1.97
ALT. (ft)		—*	2000 →						
IAS (mph)		198	169.5	149.5	139.5	130	120	111	144
M.P.	#1	50.7	50.7	50.7	50.5	50.6	50.7	50.6	50.7
("Hg)	#2	50.5	50.5	50.5	50.4	50.4	50.5	50.5	50.5
Torque	#1	187	186.5	186.5	187.5	187.5	187.5	187.5	187.5
(psi)	#2	190	189	189	191	191	191	191	191
RPM	#1	2560	2570	2555	2535	2535	2535	2525	2555
	#2	2560	2560	2550	2530	2530	2520	2520	2650
FF (PC)		2 →							
CAP	#1	4	5	5	4	4	4	4	4
(?)	#2	8	8	8	7	6	6	6	6
COWL	#1	7.7 →							
FLAPS	#2	7.3 →							
OIL COOLER	#1	35.5	36.0	36.5	37.0	37.4 →			
(deg open)	#2	34.5	35.0	35.5	36.0	36.5 →			
FUEL	#1	855	835	806	784	763	742	721	704
(gals used)	#2	854	834	804	782	761	740	719	697
To		176/177	178/180	181/183	184/186	187/189	190/192	193/195	197/199
MIXTURE		N →							
FUEL FLOW	#1								
(#/hr)	#2								

FUEL S.G. 5.78
FUEL TEMP. 17°C
START ENG. 1546
TAKE OFF 1603
GR. BRK. ALT. 760 (29.92)
" " FAT. 15°C
FLIGHT TIME 2+10 HRS

* LEVEL FLIGHT

* inches open

APPENDIX III
16

FLIGHT DATA SHEET

XC-123 AF No. 48-33 Flight No. 10 Date 8 MARCH 1951

ALL [illegible]

TEST: Single Engine Check Climb & 10000 Ft. Level Flight

POD OFF

REC. NO.										1	2	3
TIME (min)	0	.95	1.53	2.43	3.20	4.97	6.00	7.33	9.12			
ALT. (ft)	3450	3750	3950	4250	4450	4950	5250	5550	5950	10050	10050	10050
IAS (mph)	117	120	121	120	121	120	119	120	121	204	216	209
M.P. #1	—	—	—	—	—	—	—	—	—	57.4	50.6	46.1
("Hg) #2	58.3	58.1	58.7	59.4	59.2	59.0	58.8	58.6	58.2	56.7	50.8	41.7
Torque #1	—	—	—	—	—	—	—	—	—	186	189	178
(psi) #2	218	217	214	212	211	207	205	203	200			
RPM #1	—	—	—	—	—	—	—	—	—	2770	2550	2400
#2	2690 →								→ 2690			
FAT (°C)	3	2	2	1	1	0	0	-1	-1	0	0	2
CHT #1	—	—	—	—	—	—	—	—	—	3	1	4
(°C) #2	8	7	7	7	7	6	6	5	4	8	5	7
COWL #1	.85 →								→ .85	7.6	2.6	2.6
FLAPS* #2	8.0 →								→ 8.0			
OIL COOLER #1	0	0	0	0	0	0	0	0	0	32	33	33
(deg open) #2	36	36	36	36	36	36	36	36	36			
TOTALIZER #1	32	32	32	32	32	32	32	32	32	82	165	207
(gals used) #2	51	56	61	67	73	85	92	103	114	195	280	316
On												
MIXTURE	Rich →								→ Rich	Rich	Normal	Normal
FUEL FLOW #1												
(#/hr) #2												
Gross Weight - Lbs	54750	54700	54650	54600	54550	54500	54450	54400	54350	53350	52450	52000

FUEL S.G. 5.77

FUEL TEMP. 18°C

START ENG. 10:15

TAKE-OFF 10:35

FIELD ALT. 720' (29.92)

" " TEMP. 9°C

FLIGHT TIME 2+15

* inches open

FLIGHT DATA SHEET

XC-12 AF No. 48-33 Flight No. 5 Date 24 FEB 51

ALL DATA CORRECTED FOR INSTRUMENT ERROR ONLY

TEST: SINGLE ENGINE CLIMB (LEFT PROP FEATHERED) PACK ON

RUN NO.					
TIME (min)	0	2.25	2.72	4.50	7.67
ALT. (ft)	3150	3230	3250	3700	3900
IAS (mph)	121	119	120	119	120
M.P. #1					
("Hg) #2	60	—	—	59	58.7
Torque #1					
(psi) #2	212	—	—	213	—
RPM #1					
#2	2790	—	—	2750	—
FAT (°C)	+3				
CAT #1					
(°C) #2	10				
COWL #1	1				
FLAP* #2	8				
OIL SHUTTER #1	35°				
(deg open) #2	35°				
TOTALIZER #1	41				
(gals used) #2	66	75		95	
Cn	5	6	7	8	9
MIXTURE	R				
FUEL FLOW #1					
(#/hr) #2					

FUEL S.G. 5.87

GROSS WT. @ START ENGINES 63,915 LBS.

FUEL TEMP. 4°C

START ENG. 09:50

TAKE OFF 10:15

GR. BLK. ALT. 400' (29.92)

" " FAT. 3°C

FLIGHT TIME 2+20

* inches open

APPENDIX III

FLIGHT DATA SHEET

XC-120 AF No. 48-330 Flight No. 11 Date 8 MARCH 1951

CYLINDER HEAD TEMPEATURES DURING A CLIMB WITH RATED POWER

Altitude - ft	Cyl. A-1	Cyl. A-2	Cyl. A-3	Cyl. A-6	Cyl. A-7	Cyl. B-2	Cyl. B-3	Cyl. B-7	Cyl. C-1	Cyl. C-2
5200	214	211	207	194	191	224	206	189	208	216
5900	219	211	208	194	191	225	207	189	208	218
6600	219	211	208	192	190	225	206	188	207	217
7200	216	210	207	190	189	224	205	187	205	215
8000	215	208	207	189	189	223	205	185	203	215
9000	215	207	206	189	190	222	205	187	205	215
10000	215	207	205	191	192	222	205	189	206	215
11000	216	207	204	192	191	222	204	189	207	215
12000	217	206	203	194	191	222	204	190	207	216
13000	218	207	204	196	193	223	204	192	209	218
14000	221	209	206	197	195	225	205	193	210	219
15000	221	211	206	198	195	226	206	193	210	220
16000	222	211	207	200	195	227	206	194	210	220
17000	223	213	207	201	195	228	207	195	211	223
18000	223	216	209	202	197	231	209	195	212	226
19000	224	217	209	203	197	232	208	195	212	227
20000	221	214	205	199	193	230	204	191	208	225
20500	220	213	205	198	192	229	203	191	207	223
21700	218	212	202	197	191	227	200	188	204	222
22700	215	209	199	195	189	225	196	186	201	219
23500	213	208	197	193	187	223	194	184	198	218
24500	209	205	193	190	185	219	190	181	194	215
25500	207	203	191	189	185	218	188	180	191	214
26500	202	202	189	187	183	216	185	179	187	211
LEVEL FLIGHT COOLING WITH MILITARY POWER										
18000	231	226	229	209	203	238	227	199	210	230

APPENDIX III

MCRF Form 20
(3 Jun 46)

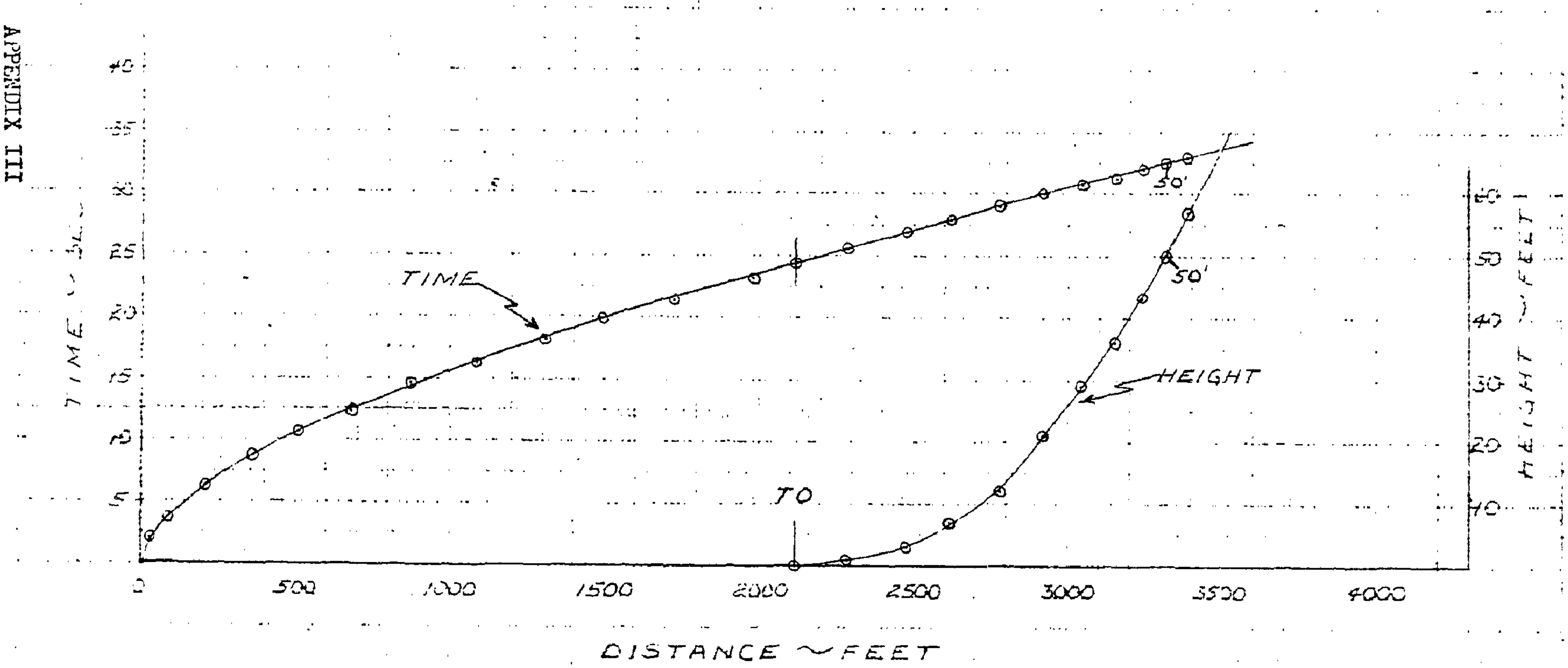
This form replaces MCRF Form No. 52, 3 Jun 46, existing stock of which will be used until exhausted.

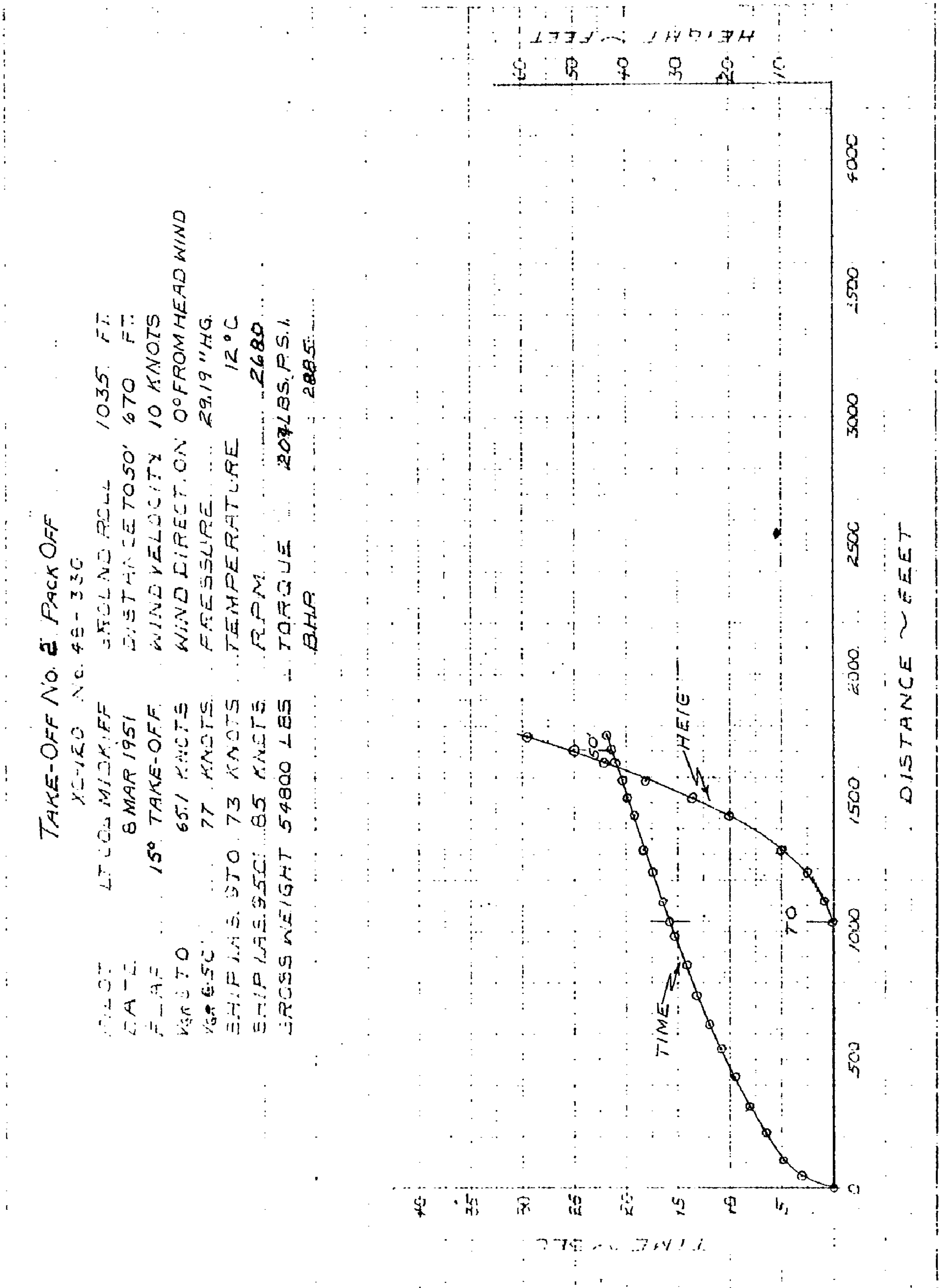
Air Force-WPAFB-1-15 FEB 51 3M

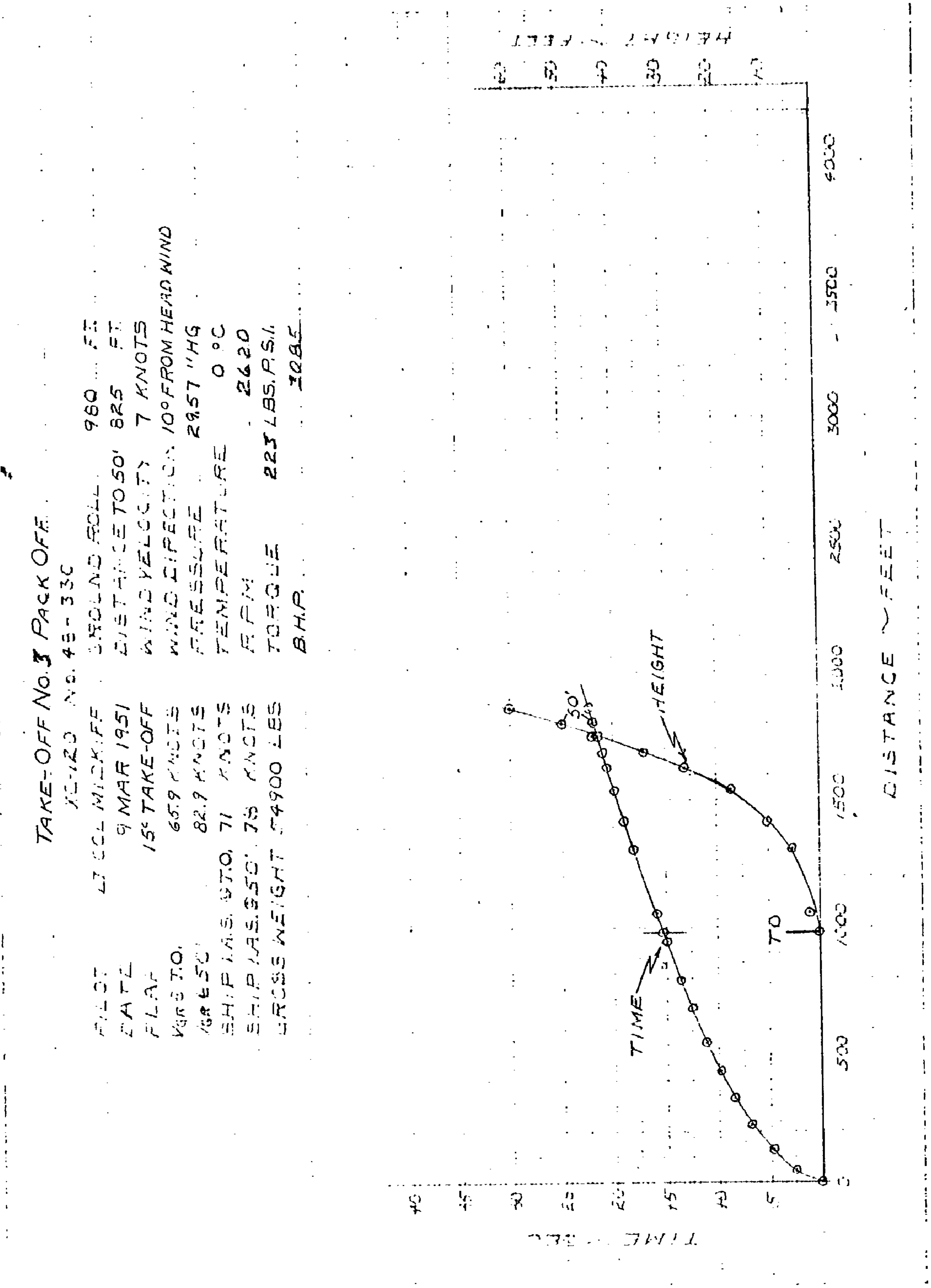
TAKE-OFF No. 1. PACK ON

XC-120 No. 48-330

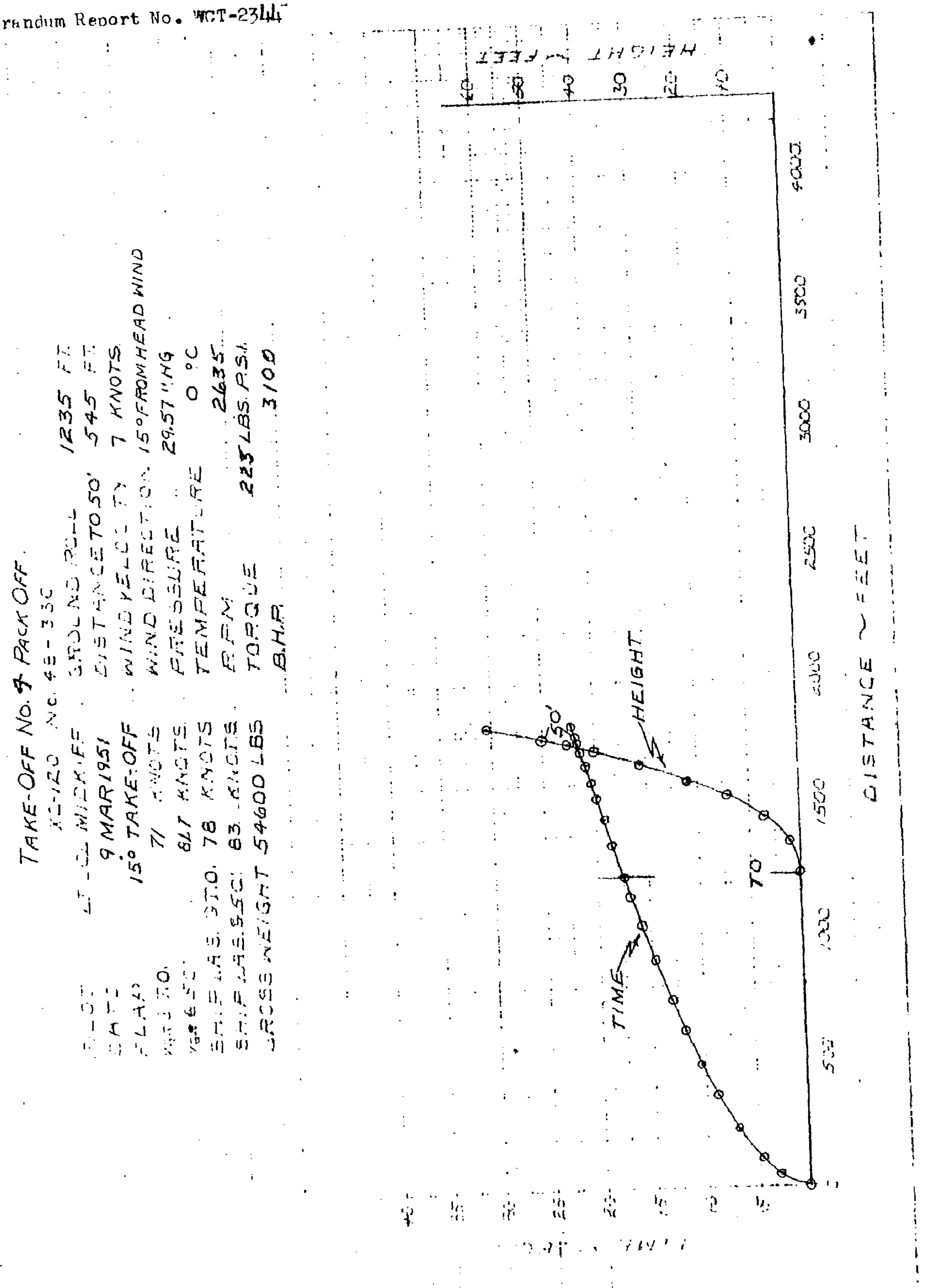
PILOT	LT COL MIDKIFF	GROUND ROLL	2115 FT.
DATE	23 FEB 1951	DISTANCE TO 50'	1200 FT.
FLAP	0 DEG.	WIND VELOCITY	3 KNOTS
V_{GR} @ TO	85.3 KNOTS	WIND DIRECTION	50° FROM HEAD WIND
V_{GR} @ 50'	93.6 KNOTS	PRESSURE	29.57" HG.
SHIP IAS @ TO	88 KNOTS	TEMPERATURE	6 °C
SHIP IAS @ 50'	— KNOTS	RPM	2740
GROSS WEIGHT	63500 LBS	TORQUE	208 LBS. P.S.I.
		B.H.P.	3010

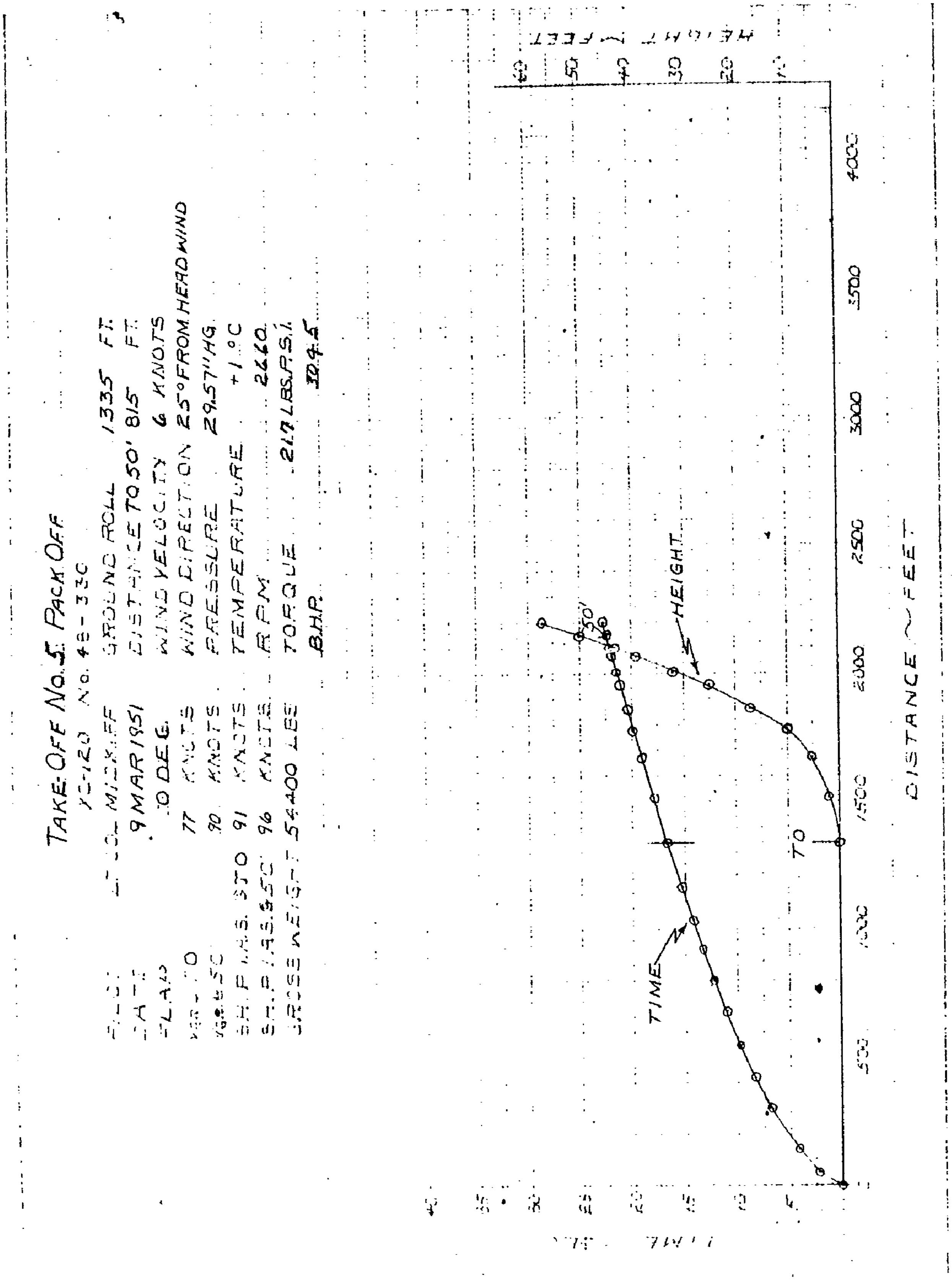



TAKE-OFF No. 2 PACK OFF
XC-120 No. 48-330
PILOT LT COL MIDKIFF
DATE 8 MAR 1951
FLAP 15° TAKE-OFF
V_GR @ TO 65.1 KNOTS
V_GR @ 50' 77 KNOTS
SHIP I.A.S. @ TO 73 KNOTS
SHIP I.A.S. @ 50' 85 KNOTS
GROSS WEIGHT 54800 LBS
GROUND ROLL 1035 FT.
DISTANCE TO 50' 670 FT.
WIND VELOCITY 10 KNOTS
WIND DIRECTION 0° FROM HEAD WIND
PRESSURE 29.19 "HG.
TEMPERATURE 12°C
RPM 2680
TORQUE 204 LBS. P.S.I.
BHP 2885
TIME
HEIG
TO
50'
DISTANCE ~ FEET
0 500 1000 1500 2000 2500 3000 3500 4000
5 10 15 20 25 30 35 40
10 20 30 40 50 60



TAKE-OFF No. 3 PACK OFF
No. 48-33C
9 MAR 1951
15° TAKE-OFF
65.9 KNOTS
82.9 KNOTS
71 KNOTS
78 KNOTS
54900 LBS
GROUND ROLL 980 FT
DISTANCE TO 50' 825 FT
WIND VELOCITY 7 KNOTS
WIND DIRECTION 10° FROM HEAD WIND
PRESSURE 29.57 "HG
TEMPERATURE 0 °C
RPM 2620
TORQUE 223 LBS. P.S.I.
B.H.P. 1085
HEIGHT
TIME
TO
50'
DISTANCE ~ FEET
0
500
1000
1500
2000
2500
3000
3500
4000

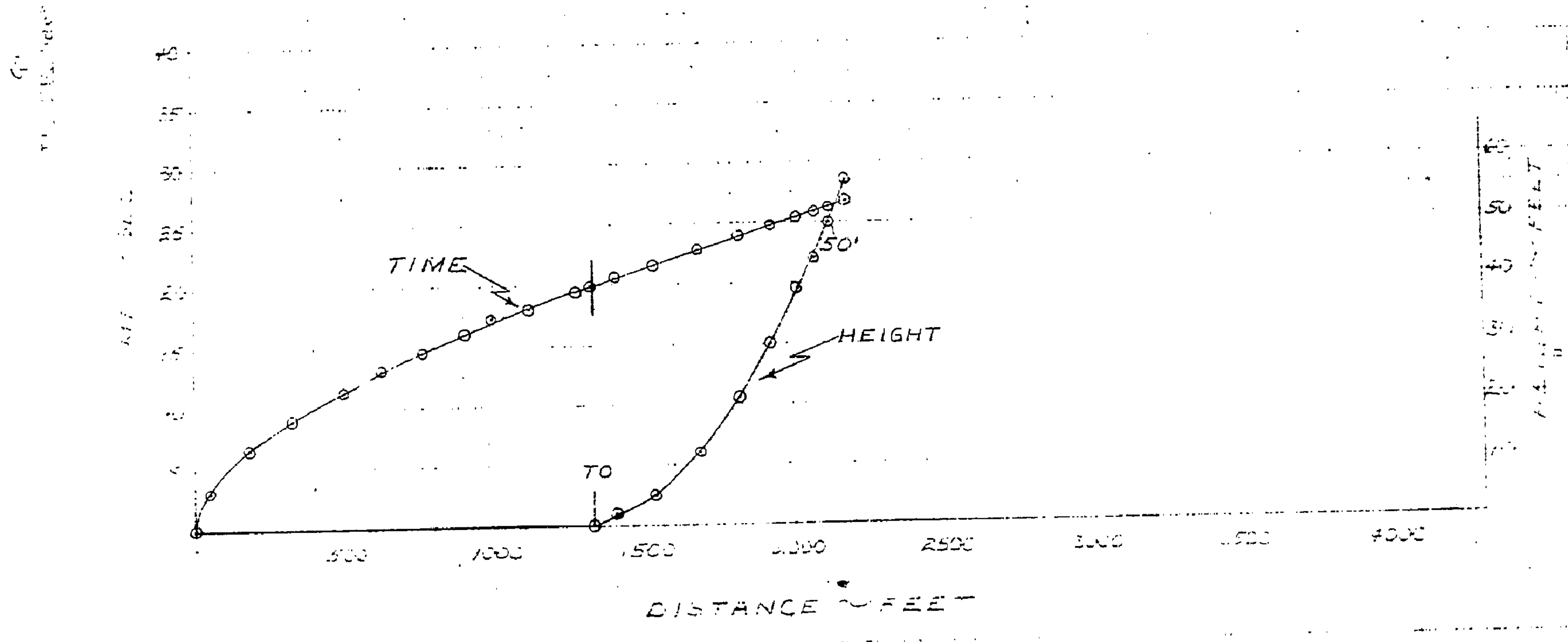

TAKE-OFF NO. 4 PACK OFF
XC-120 No. 48-330
9 MAR 1951
15° TAKE-OFF
71 KNOTS
81 KNOTS
78 KNOTS
83 KNOTS
GROSS WEIGHT 54600 LBS
GROUND ROLL 1235 FT.
DISTANCE TO 50' 545 FT.
7 KNOTS
15° FROM HEAD WIND
PRESSURE 29.57 "HG
TEMPERATURE 0 °C
RPM 2635
TORQUE 225 LBS. P.S.I.
B.H.P. 3100
TIME
HEIGHT
TO
50'
DISTANCE ~ FEET
HEIGHT ~ FEET
500
1000
1500
2000
2500
3000
3500
4000
10
20
30
40
50
60

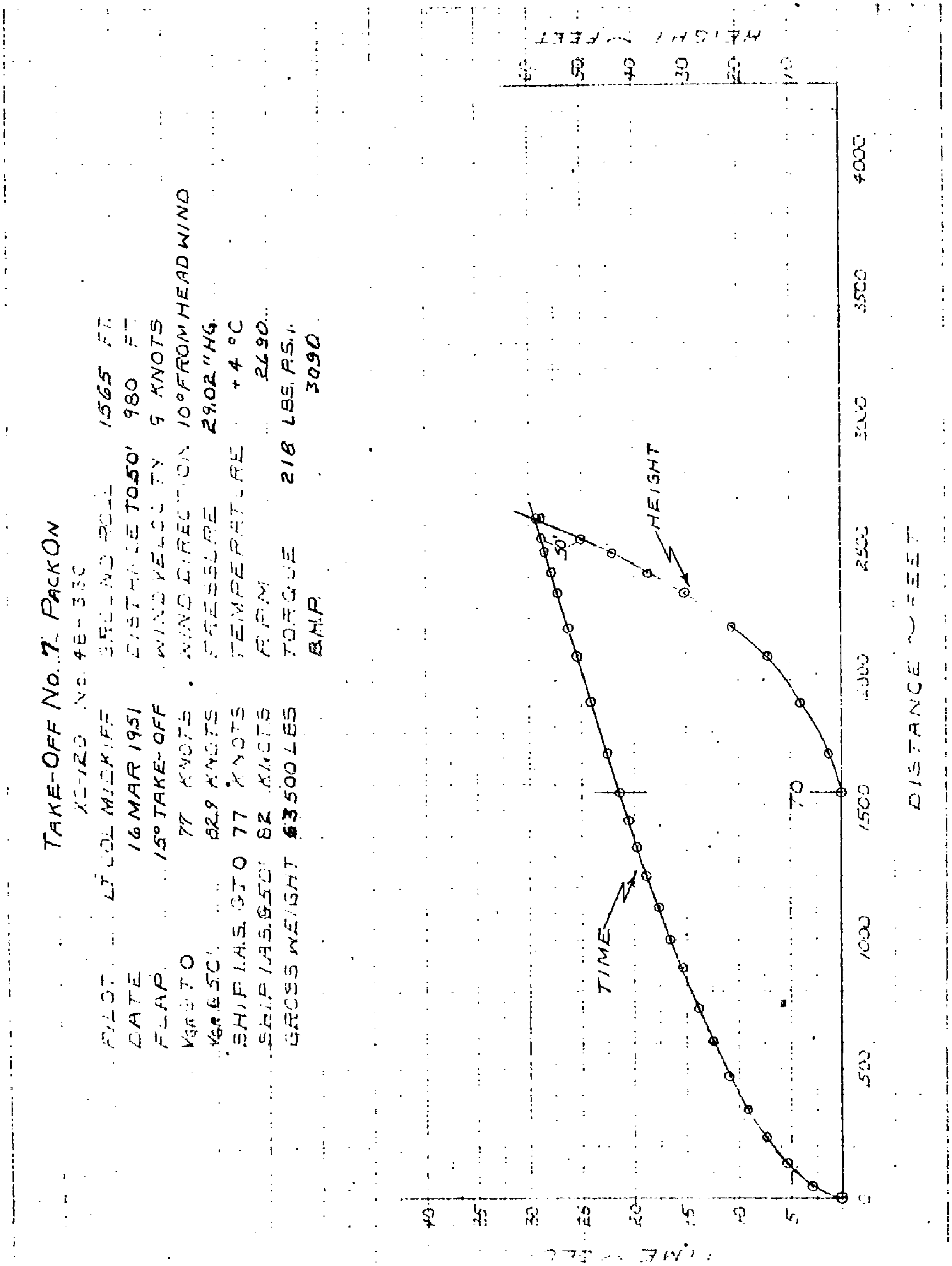

TAKE-OFF No. 5 PACK OFF
YC-120 No. 48-330
PILOT MIDKIFF
DATE 9 MAR 1951
FLAPS 0 DEG.
77 KNOTS
90 KNOTS
91 KNOTS
96 KNOTS
GROSS WEIGHT 54400 LBS
GROUND ROLL 1335 FT.
DISTANCE TO 50' 815 FT.
WIND VELOCITY 6 KNOTS
WIND DIRECTION 25° FROM HEADWIND
PRESSURE 29.57"HG.
TEMPERATURE +1°C
RPM 2660
TORQUE 217 LBS.P.S.I.
B.H.P.
HEIGHT
TIME
TO
50'
DISTANCE ~ FEET
HEIGHT ~ FEET
500
1500
2000
2500
3000
3500
4000
10
20
30
40
50
60

TAKE-OFF No. 6 PACK ON

XC-120 No. 48-330

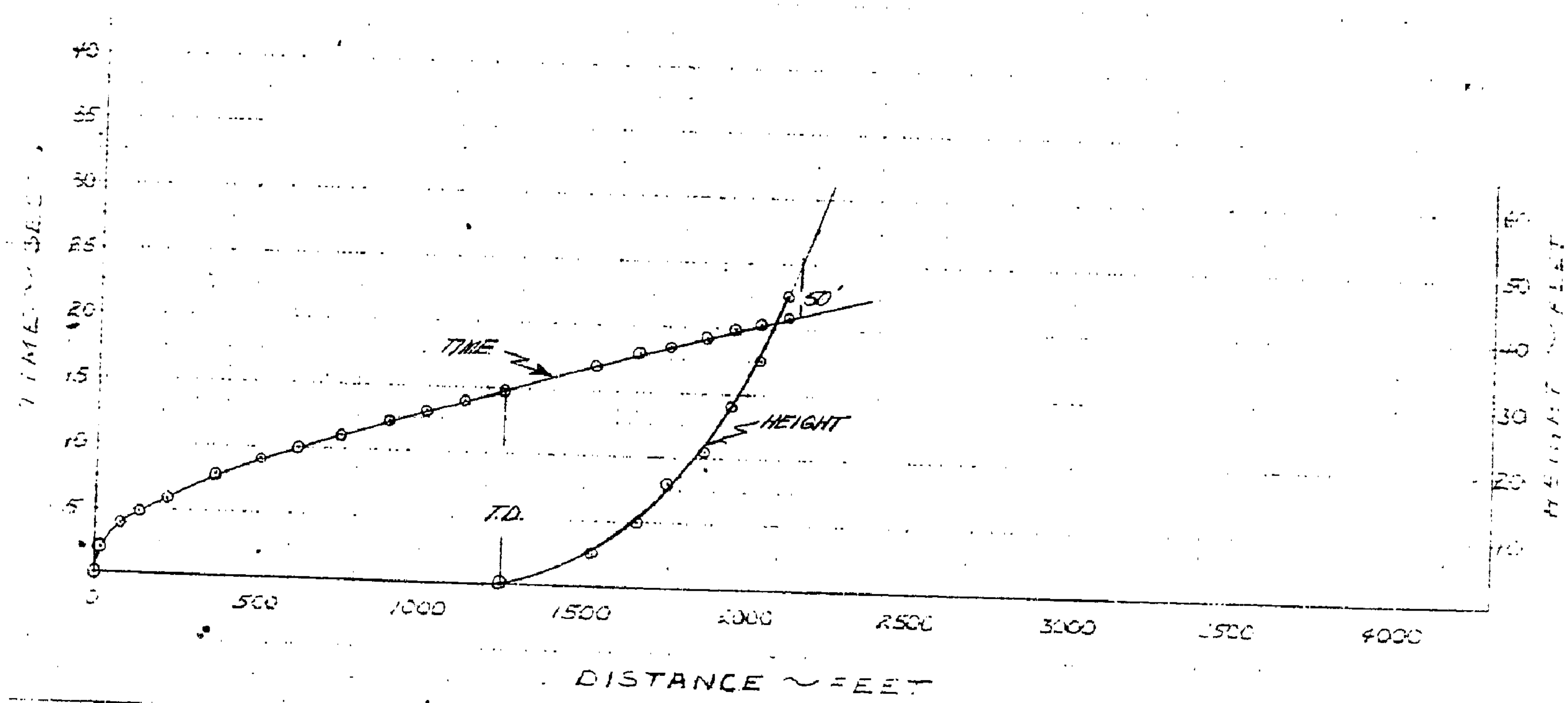
PILOT	LT COL MICKIFF	GROUND ROLL	1330 FT.
DATE	16 MAR 1951	DISTANCE TO 50'	790 FT.
FLAP	15° TAKE-OFF	WIND VELOCITY	10 KNOTS
V_{CAL} @ T O	73.4 KNOTS	WIND DIRECTION	0° FROM HEAD WIND
V_{CAL} @ 50'	77 KNOTS	PRESSURE	29.02 "HG
SHIP I.A.S. @ T O	83 KNOTS	TEMPERATURE	0 °C
SHIP I.A.S. @ 50'	85 KNOTS	R.P.M.	2700
GROSS WEIGHT	63,800 LBS	TORQUE	212 LBS.P.S.I.
		BHP	3025




TAKE-OFF No. 7 PACK ON
DATE 16 MAR 1951
FLAP 15° TAKE-OFF
V_{GR} @ T O 77 KNOTS
V_{GR} @ 50' 82.9 KNOTS
SHIP I.A.S. @ T O 77 KNOTS
SHIP I.A.S. @ 50' 82 KNOTS
GROSS WEIGHT 63500 LBS
DISTANCE TO 50' 980 FT
WIND VELOCITY 9 KNOTS
10° FROM HEAD WIND
29.02" HG.
+4 °C
2690
TORQUE 218 LBS. P.S.I.
B.H.P. 3090
TIME
HEIGHT
50'
70
DISTANCE ~ FEET

LANDING No. 1 PACK OFF

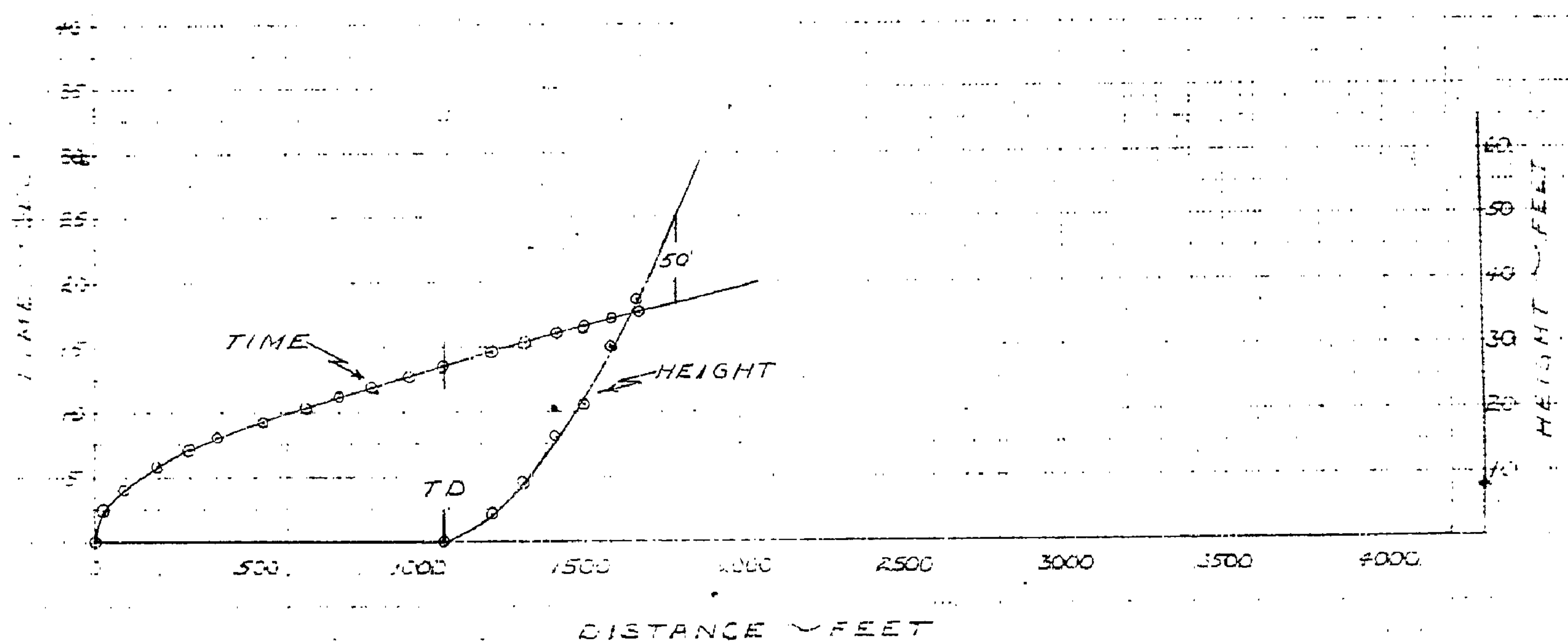
DATE	9 MAR 1951	GROUND ROLL	1250 FT
FLAP	40° LANDING	DISTANCE FROM 50'	910 FT
V_{TD}	79.4 KNOTS	WIND VELOCITY	5 KNOTS
V_{50}	91.8 KNOTS	WIND DIRECTION	35° FROM HEADWIND
SH. P. I.A.S. @ T.D.	[illegible] KNOTS	PRESSURE	31.47" HG
SH. P. I.A.S. @ 50'	105 KNOTS	TEMPERATURE	0 °C
GROSS WEIGHT	54500 LBS	R.P.M.	IDLE
		TORQUE	IDLE
		B.H.P.	IDLE



LANDING No.2 PACK OFF

XC-120 No. 48-330

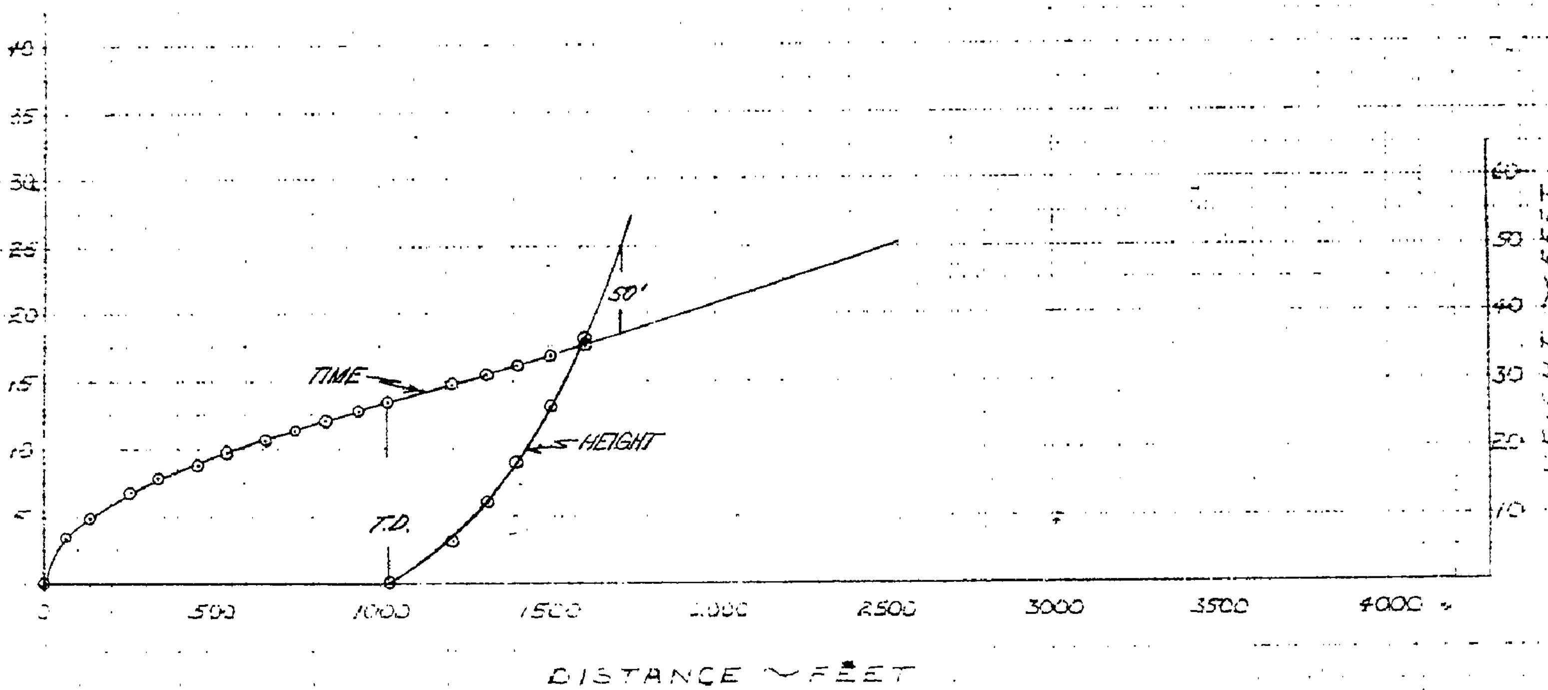
PILOT	LT COL MICKOFF	GROUND ROLL	1085 FT.
DATE	9 MAR 1951	DISTANCE FROM 50'	725 FT.
FLAP	40° LANDING	WIND VELOCITY	5 KNOTS
V_{SR} @ TD	80.5 KNOTS	WIND DIRECTION	60° FROM TAIL WIND
V_{SR} @ 50'	100.7 KNOTS	PRESSURE	31.36" HG
SHIP IAS. STD	87 KNOTS	TEMPERATURE	+1 °C
SHIP IAS @ 50'	104 KNOTS	RPM	IDLE
GROSS WEIGHT	54300 LBS	TORQUE	IDLE
		BHP	IDLE

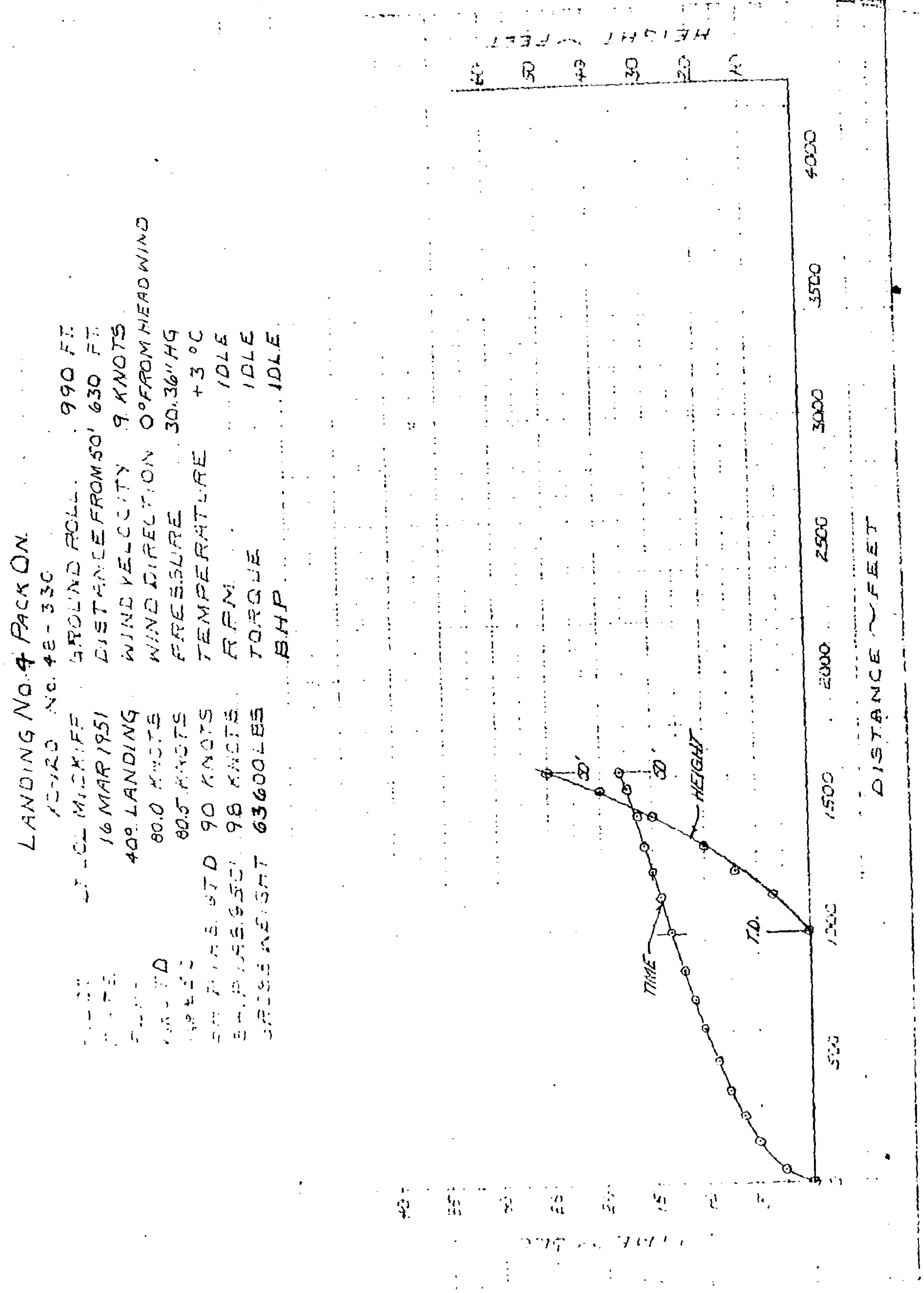


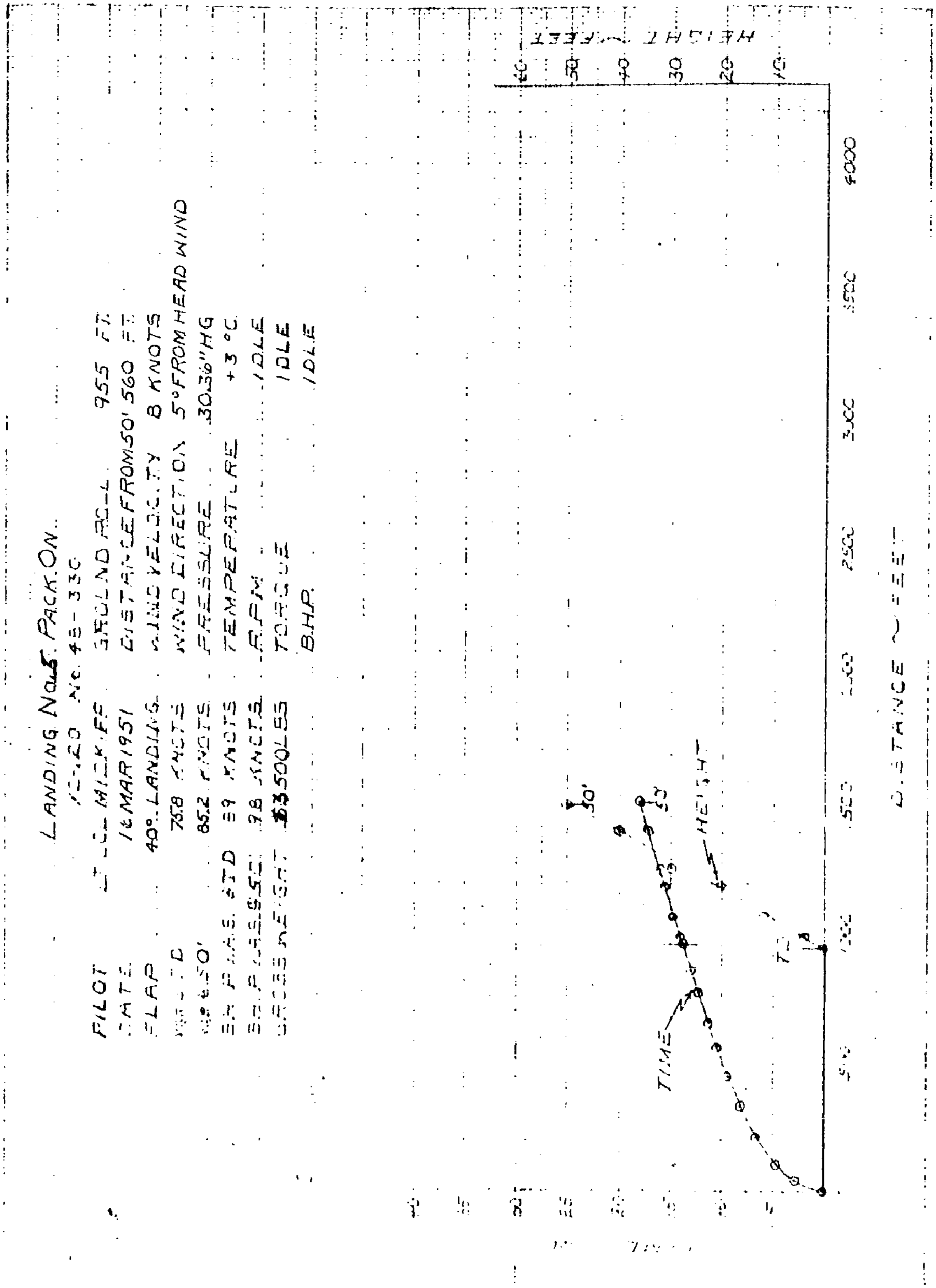
LANDING No. 3 PACK OFF

XC-120 No. 48-330

PILOT	LT COL MACK FF	GROUND ROLL	1030 FT.
DATE	9 MAR 1951	DISTANCE FROM 50'	690 FT.
FLAP	40° LANDING	WIND VELOCITY	5 KNOTS
V_{GR} @ T.D.	62.9 KNOTS	WIND DIRECTION	5° FROM HEAD WIND
V_{GR} @ 50'	82.9 KNOTS	PRESSURE	31.36 " HG
SHIP I.A. STD.	87 KNOTS	TEMPERATURE	+1 °C
SHIP I.A. @ 50'	96 KNOTS	R.P.M.	IDLE
GROSS WEIGHT	54100 LBS	TORQUE	IDLE
		B.H.P.	IDLE




LANDING No. 4 PACK ON.
No. 48-330
16 MAR 1951
40° LANDING
80.0 KNOTS
80.5 KNOTS
90 KNOTS
98 KNOTS
GROSS WEIGHT 63600 LBS
GROUND ROLL 990 FT.
DISTANCE FROM 50' 630 FT.
WIND VELOCITY 9 KNOTS
WIND DIRECTION 0° FROM HEAD WIND
PRESSURE 30.36" HG
TEMPERATURE +3 °C
RPM IDLE
TORQUE IDLE
BHP IDLE
TIME
HEIGHT
T.D.
50'
50'
DISTANCE ~ FEET
500
1000
1500
2000
2500
3000
3500
4000
HEIGHT ~ FEET
10
20
30
40
50
60


LANDING No.5 PACK.ON
No. 48-330
PILOT
DATE 16 MAR 1951
FLAP 40° LANDING
75.8 KNOTS
85.2 KNOTS
89 KNOTS
78 KNOTS
GROSS WEIGHT 53500 LBS
GROUND ROLL 955 FT
DISTANCE FROM 50' 560 FT
WIND VELOCITY 8 KNOTS
WIND DIRECTION 5° FROM HEAD WIND
PRESSURE 30.30" HG
TEMPERATURE +3 °C
RPM IDLE
TORQUE IDLE
B.H.P. IDLE
HEIGHT ~ FEET
10
20
30
40
50
60
TIME
HEIGHT
50'
TD
DISTANCE ~ FEET
500
1000
1500
2000
2500
3000
3500
4000

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[redacted] 40 358

ATI 114 677 **U** (U.S. MILITARY ORGANIZATIONS REQUEST COPIES FROM CADO. OTHERS ROUTE REQUESTS TO CADO THRU WADC, W-P AFB, DAYTON, OHIO. ATTN: WCTSE)

WADC; FLIGHT TEST DIV.. WRIGHT-PATTERSON AIR FORCE BASE, DAYTON, O. (SERIAL NO. WCT-2344)

PHASE II TESTS ON THE XC-120 AIRPLANE, USAF NO. 48-330 - AND APPENDIXES I-III - MEMORANDUM REPORT

GLENN, NORMAN J.; MIDKIFF, RICHARD L. 5 JULY '51
126PP PHOTOS, TABLES, GRAPHS

Transport Aircraft

AIRPLANES, TRANSPORT -	AERODYNAMICS (2)	1	9
FLIGHT TESTING	PERFORMANCE (2)	2	6, 7
C-120 Aircraft			

EO 10501 dd 5 NOV 1953 Pl 3.5

[redacted]

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10. NAME, TITLE, PHONE NUMBER OF REQUESTING OFFICIAL
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SECTION II. BIBLIOGRAPHIC INFORMATION

11. AD NUMBER (If Known): AD-B802822

12. (TITLE, REPORT NUMBER, AUTHOR(S)), ETC

Tests on the XC-120 Airplane. Phase 2. Appendixes 1-3, 126 pages

SECTION III. REQUESTER JUSTIFICATION

13. REQUESTER JUSTIFICATION (Explain need in detail)

A paper copy of this unclassified document, currently releasable to DOD only, is being requested for administrative use in a preliminary project study. NASA-DFRC engineers are looking at several possible concepts for future Unmanned Aerial Vehicle applications. This historical document may help determine a future NASA REVCON (Revolutionary Concept) proposal to be engineered at this Center.

SECTION IV. RELEASING AGENCY

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WRIGHT AIR DEVELOPMENT CTR
WRIGHT-PATTERSON AFB OH

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5. SIGNATURE: [signature]

6. DATE: 14 Apr 00

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